THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1389.] LONDON, DECEMBER 24, 1889. [41ST YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
The Original "Torbay Paints"
As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.
Illustrated Price List Post Free.
TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 1129.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
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Office: 7, PIER STREET.
Works: WILMINGTON.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

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"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz. :—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

Cool Bars.
Easy Clinkering.
Independent of Chimney Draught.
Without moving parts.

Requires no extra Space.
Cannot get out of order.
Moderate Cost.
Results Guaranteed.

BREEZE FURNACES
FOR STEAM RAISING AND RETORT FIRING.
By adopting this System, Gas-Works practically save the whole cost of Fuel.
Knowing the value of these Furnaces, **MELDRUM BROTHERS** are prepared to fit them up, **ON APPROVAL,** to Lancashire, Cornish, Egg-ended, or other Type of Steam-Boiler; also to Retort-Furnaces. Terms on application.

MELDRUM BROTHERS,
26, HALF STREET, CATHEDRAL YARD, MANCHESTER.
TELEGRAMS: "MELDRUM MANCHESTER."

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers and Contractors for the Erection of Gas-Works.

MANUFACTURERS OF IMPROVED GAS-EXHAUSTING APPARATUS.

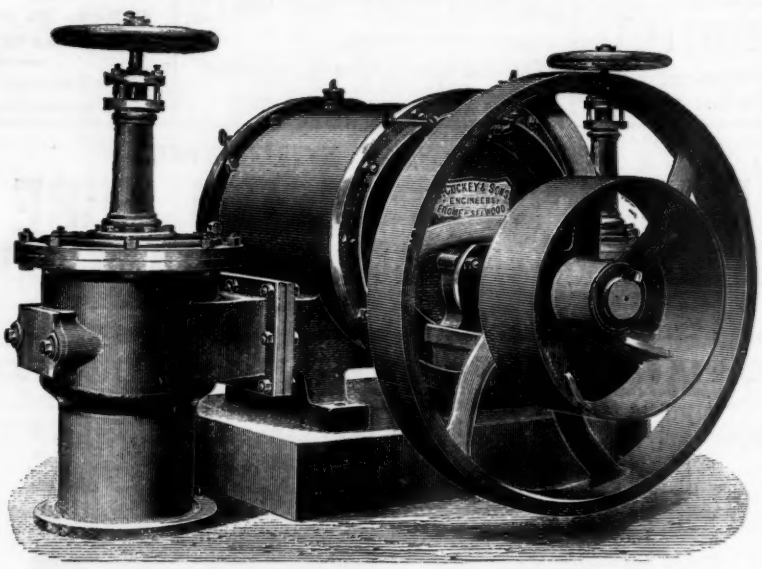
A Large Stock of Valves always on hand.

Lamp Columns; various patterns.

Wood Grids for Purifiers and Scrubbers.

Castings of every description.

Apparatus for the manufacture of Sulphate of Ammonia.



Experienced Retort-Setters constantly employed.

Lead Burning and Plumbing in all its Branches.

Gas-Fittings in great variety.

Brass Castings.

Patent Washers and Valves.

Boilers and Engines.

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HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

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MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

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MANUFACTURERS OF

GAS APPARATUS

OF EVERY DESCRIPTION

INCLUDING

GASHOLDERS

and Tanks,

Retorts, Purifiers,

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Condensers,

ETC., ETC.

All of the most approved Designs.

BOILERS, ENGINES, PUMPS,

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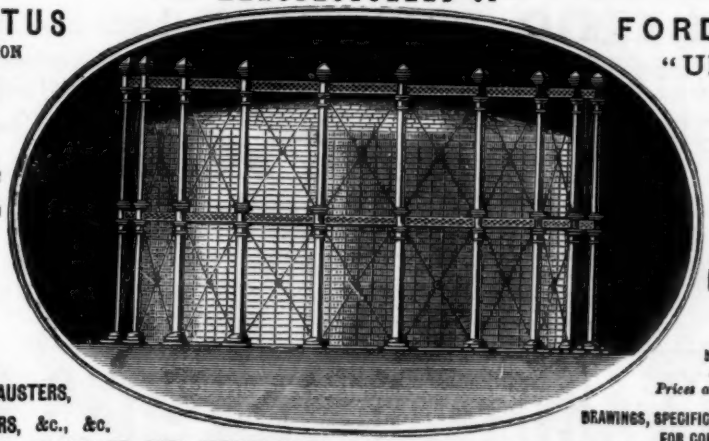
METERS, GAUGES, GOVERNORS, &c., &c.



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SCRUBBER-

WASHER.

Numbers at work, giving excellent results.

No Motive Power Required.

ALSO OF

SOMERVILLE'S PATENT

RETORT MOUTHPIECES

AND

SELF-SEALING LIDS.

NO LUTING REQUIRED.

Prices and Particulars on application.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES PREPARED FOR COMPLETE GAS PLANT.

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ESTABLISHED 1825.

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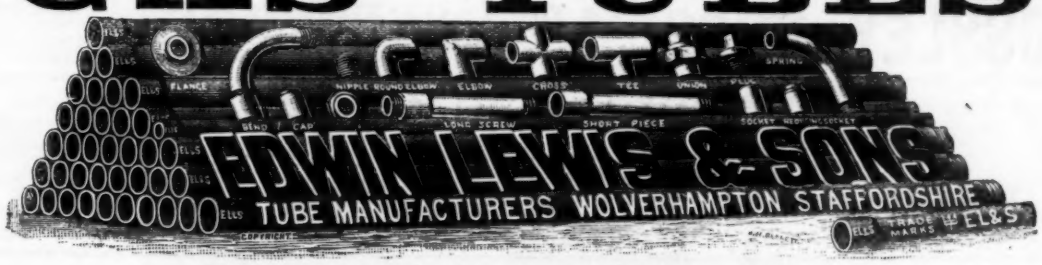

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FOR ANY PURPOSE.

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MANUFACTURERS OF

SLIDE VALVES,

WITH RACK & PINION,

OR

Internal or External SCREWS, of all Sizes.

GASHOLDERS,

AND

Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description,

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON

CONDENSERS,

SCRUBBERS, & WASHERS.

TAR AND LIQUOR PUMPS, &c.

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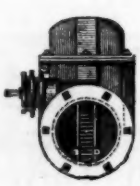
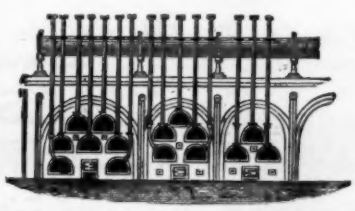
CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.



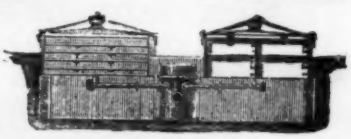


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

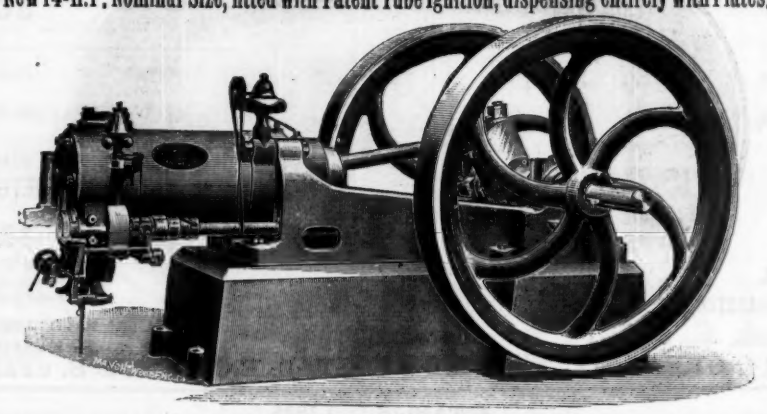
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

100 Prize Medals.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES *2-Man to 100-HP.*

GAS-ENGINES COMBINED WITH **PUMPS** FOR TOWNS SUPPLY, SEWAGE, &c., &c.

GAS-ENGINES COMBINED WITH **AIR COMPRESSORS** FOR THE SHONE SEWAGE SYSTEM, LUCIGEN LIGHT, &c.

MADE in SIZES *2-Man to 100-HP.*

VERTICAL AND HORIZONTAL TYPES.

ENGINES *COMBINED* WITH HOISTS, PUMPS DYNAMOS, &c. &c.

Largely used for EXHAUSTING, PUMPING, COKE CRUSHING, ELECTRIC LIGHTING, &c., &c.

Over **31,000** "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

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HARRIS & PEARSON,

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FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

MANUFACTURERS AND BUILDERS OF

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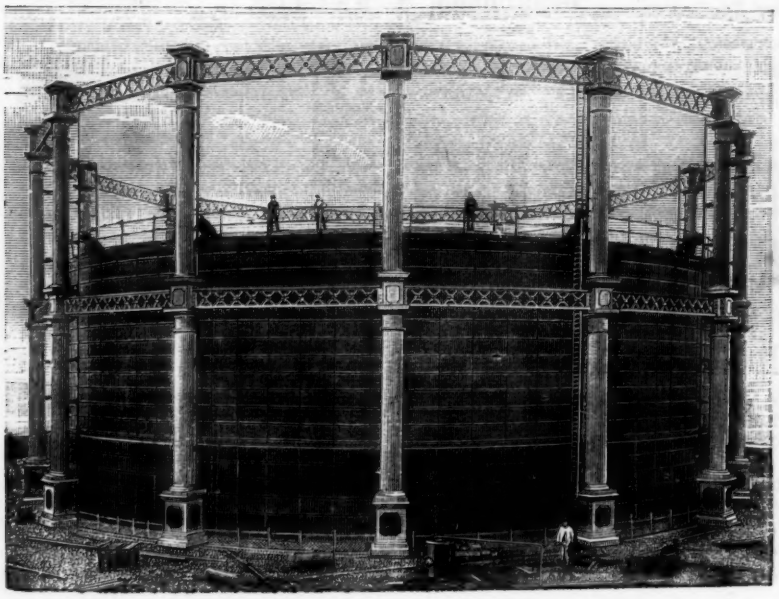
In SINGLE, DOUBLE, TREBLE, or QUADRUPLE LIFTS,



With Cast or Wrought Iron

COLUMNS or STANDARDS

Single-Lift Holders

Converted into

TELESCOPES.

GASHOLDER TANKS IN Steel or Wrought Iron.

CAST-IRON Gasholder Tanks WITH PLANED JOINTS.

HORSELEY COMPANY, LTD.

TIPTON, STAFFORDSHIRE.

London Office: 6, Westminster Chambers, Victoria Street.

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS,

AND ALL KINDS OF GAS AND WATER WORKS PLANT.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

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TRADE	TELEGRAMS:	LONDON AGENTS:
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SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER, ENGINEERS,

NOTTINGHAM,

OR TO

MAURICE SCHWAB,

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The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 APPARATUS).
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NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
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And to the following Gas Companies and Corporations:—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
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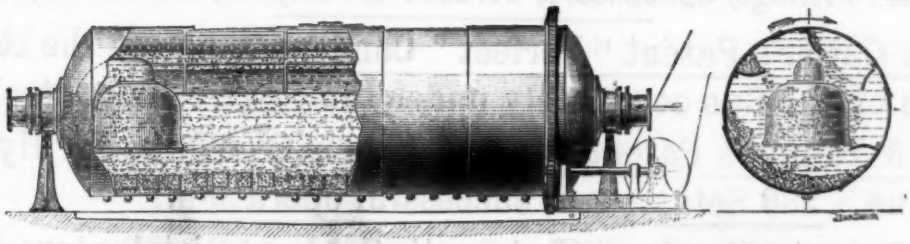
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

THE REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY. REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

GOLD MEDAL, INVENTIONS EXHIBITION, 1885.

Revolving Purifier Company, Limited,

DOCK HOUSE, BILLITER STREET, LONDON, E.C.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

LONDON OFFICE, 60, QUEEN VICTORIA ST. E.C.

CLAYTON SON & Co LIMITED, LEEDS.

MAKE

RETORT LIDS

OF ALL FORMS & SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,

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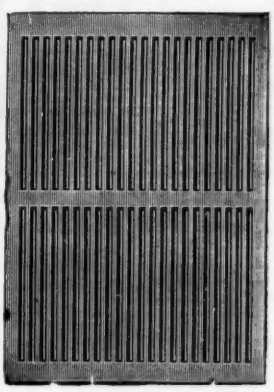
MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

R. & J. DEMPSTER'S



WOOD GRIDS FOR PURIFIERS

Made from any kind of Timber, of any Size or Shape, by trained Workmen and specially-designed Machinery.

Quick delivery and accuracy guaranteed.

BOARDS FOR SCRUBBERS

Cut and fitted upon the most successful system.

GRIDS FOR SULPHATE PLANTS.

Prices moderate. Inquiries solicited. Estimates free.

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GAS PLANT WORKS,

NEWTON HEATH, MANCHESTER.

SULPHATE OF AMMONIA PLANT.

MESSRS. CUTLER,

Are now giving special attention to

PLANT FOR THE MANUFACTURE OF SULPHATE OF AMMONIA,

And are prepared to supply Companies with the best and most efficient Apparatus on reasonable terms.

Plans, Specifications, and Prices on Application.

Retort-Fittings, Condensers, Scrubbers, Purifiers, Gasholders, &c.

Morris & Cutler's Patent "Perfect" Condenser places the temperature of the Gas completely under the Engineer's control.

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Cutler's Patent "Simplex" (Automatic Syphon) Distributor. Largely adopted, and very successful.

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KIRKHAM, HULETT, & CHANDLER, Ld.,

PALACE CHAMBERS,

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Mr. S. HERSEY, Managing-Director.

THE "NEW" PATENT

"Standard" Washer-Scrubber,

As supplied to The Gaslight and Coke Company, &c., &c., &c.

The Gaslight and Coke Company,
Horseferry Road, S.W.,
Nov. 25, 1889.

Messrs. Kirkham, Hulett, and Chandler, Ltd.,

Gentlemen,—In reply to your enquiry respecting the result of putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say that they have answered admirably for the few months they have been in; and I think them a decided success.

I am, yours truly,
(Signed) G. C. Trewby.

The Improvements comprised in the "New" Patent "Standard" Washer-Scrubber have been applied to the original "Standard" Washer-Scrubbers at Beckton. *(See the above.)*

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

Particulars will be furnished upon application to the above address.

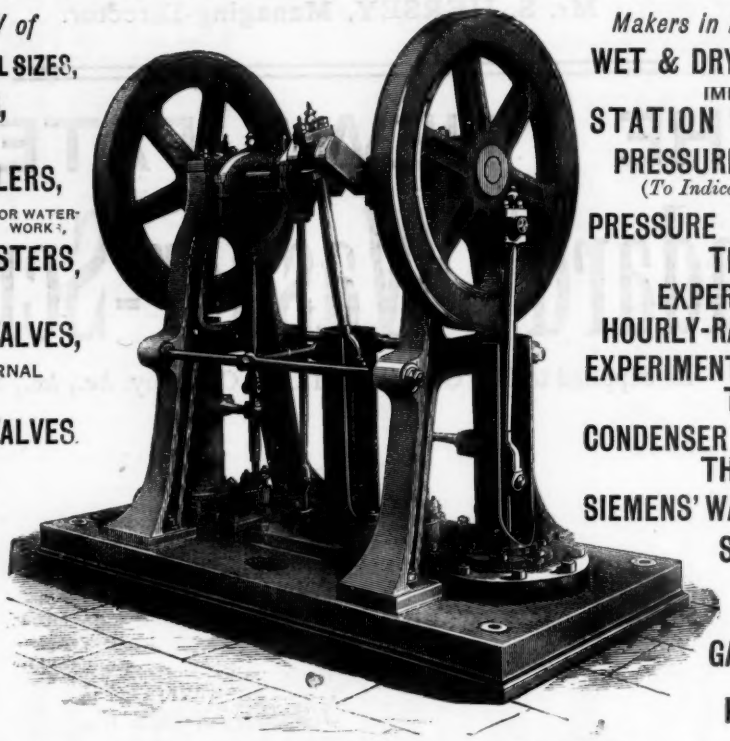
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

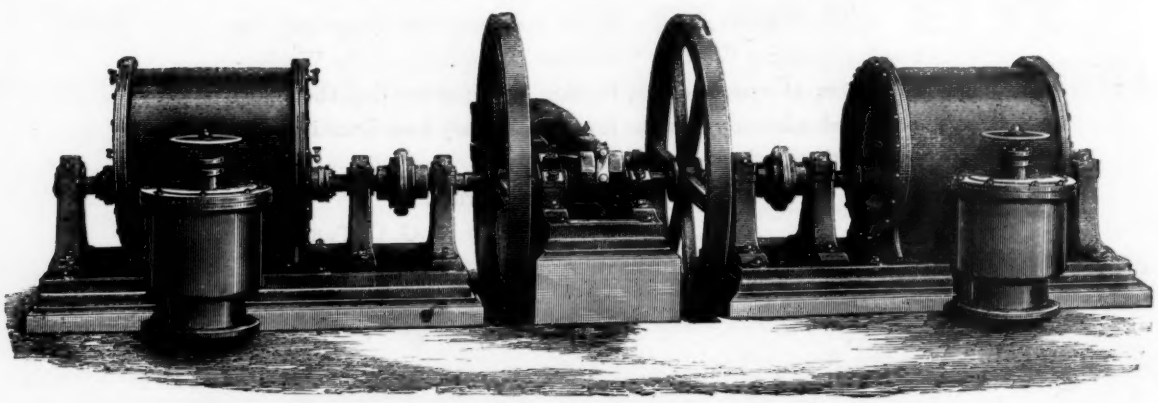
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS (*To Indicate New Time*),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

TANGYES LIMITED,

CORNWALL WORKS, BIRMINGHAM.

DEPÔTS AT

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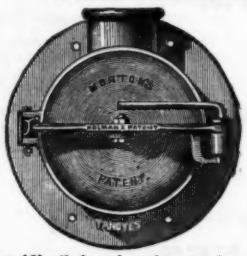
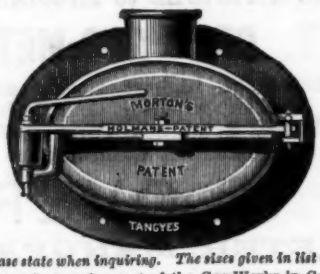
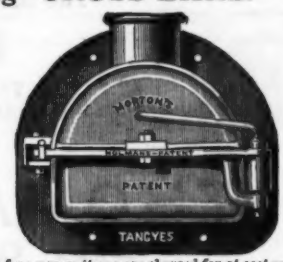
NEWCASTLE-ON-TYNE ST. NICHOLAS BUILDINGS
MANCHESTER . . . . . DEANSGATE
GLASGOW . . . . . ARGYLE STREET

Sole Makers of **MORTON'S** Patent Self-Sealing **RETORT-LIDS,**

With Anti-Friction CATCHES, and Self-Sustaining CROSS-BARS.







Price of Mouthpieces depends on number required, which please state when inquiring. The sizes given in list we have patterns for; new patterns are charged for at cost price.

These Patent Retort Lids and Fastenings are in extensive use in most of the Gas-Works in Great Britain, America, and on the Continent, and have almost entirely displaced the older method of sealing by a luting of lime or other material. The Lids are made in three forms, D, oval, and round (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these lids are recommended to make their selection, in order to avoid cost of pattern making, delays, &c., &c.

Mouthpieces with Circular Lids for Oval Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
13658	14 ins.	14 × 12 ins.	15 ins.	£0 19 0
4356	14 „	18½ „ 12 „	12¾ „	0 19 0
6851	15 „	16 „ 14 „	13 „	1 0 0
3629	15 „	18½ „ 13½ „	14 „	1 0 0
3580	15 „	21 „ 15 „	15 „	1 0 0
6264	16 „	18½ „ 15½ „	15¾ „	1 1 0
5210	16 „	20 „ 14 „	15 „	1 1 0
6263	16 „	24 „ 16 „	13½ „	1 1 0
5370	17 „	20 „ 14 „	14 „	1 3 0
6832	17 „	20 „ 14 „	17 „	1 3 0
6183	17 „	20 „ 15 „	15 „	1 3 0
4289	17 „	21 „ 15 „	14 „	1 3 0
5270	17 „	22 „ 14 „	14 „	1 3 0
3631	18 „	18 „ 14 „	20 „	1 5 0
3681	18 „	21 „ 14 „	13½ or 15 „	1 5 0
3554	18 „	21 „ 15 „	14¾ „	1 5 0
7957	18 „	22 „ 16 „	14 „	1 5 0
8048*	19 „	25½ „ 15 „	18 „	1 8 6

Mouthpieces with Oval Lids for Oval Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
9800	18 × 14½ ins.	18 × 14½ ins.	15 ins.	£1 5 0
9205	20 „ 12 „	24 „ 14 „	10½ „	1 10 0
10000	20½ „ 14½ „	20½ „ 14½ „	15 „	1 10 0
9680	21 „ 15 „	21 „ 15 „	15 „	1 12 0
10056	21 „ 14½ „	21 „ 14½ „	15¾ „	1 12 0
13218	21 „ 15 „	21 „ 15 „	17 „	1 12 0
10514	22½ „ 13¾ „	22½ „ 13¾ „	13¾ „	1 13 0
13766	20 „ 17 „	20 „ 17 „	15½ „	1 15 0
13269	24 „ 15 „	24 „ 15 „	16 „	1 18 0

190

Mouthpieces for Round Retorts.

Diam. .. .. ins.	14	15	16	17	18
Price, Lid and Fittings without Mouthpiece } £	0 19 0	1 0 0	1 1 0	1 3 0	1 5 0

Mouthpieces with Circular Lids for D Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
5348	14 ins.	14 × 13 ins.	7 ins.	£0 19 0
3463	15 „	15 „ 13 „	14 „	1 0 0
6678	15 „	15 „ 14 „	12 „	1 0 0
3661	15½ „	15½ „ 13 „	12 „	1 1 0
13052	16 „	16 „ 13 „	18 „	1 1 0
5601	16 „	16 „ 14 „	15 „	1 1 0
6827	16 „	16 „ 14 „	17 „	1 1 0
4494	16 „	16 „ 14 „	14 „	1 1 0
3548	16 „	16 „ 15 „	12¾ „	1 1 0
6677	16 „	16½ „ 13½ „	12½ „	1 1 0
9645	16 „	16½ „ 13½ „	12½ „	1 1 0
4434	16 „	17½ „ 14 „	14 „	1 1 0
6469	16 „	18 „ 14 „	15 „	1 1 0
9015	16 „	18 „ 14 „	18½ „	1 1 0
4327	16 „	18 „ 15 „	15½ „	1 1 0
8049*	16 „	18 „ 15 „	17½ „	1 1 0
6137	16 „	20½ „ 13½ „	13½ „	1 1 0
5918	17 „	18 „ 14 „	14 or 17 „	1 3 0
5053	17 „	19½ „ 12 „	14½ „	1 3 0
7548	17 „	20 „ 13 „	15 „	1 3 0
6468	17 „	20 „ 16 „	15½ „	1 3 0
4316B	17 „	21 „ 14 „	14 „	1 3 0
7975	17 „	21 „ 15 „	14½ „	1 3 0
13459	17 „	21½ „ 13½ „	15 „	1 3 0
12990	18 „	18 „ 15 „	15 or 19 „	1 5 0
7135	18 „	18½ „ 15 „	13 „	1 5 0
10221	18 „	18 „ 16 „	12¾ „	1 5 0
4506	18 „	20 „ 13 „	19½ „	1 5 0
6475	18 „	20 „ 13 „	15 „	1 5 0
6818	18 „	20 „ 13½ „	17½ „	1 5 0
4083	18 „	20 „ 15 „	16 „	1 5 0
5306	18 „	20½ „ 14 „	13½ „	1 5 0
13295	18 „	20½ „ 14 „	19½ „	1 5 0
7356	18 „	20½ „ 13½ „	13 „	1 5 0
4569	18 „	21 „ 14 „	18 „	1 5 0
3628	18 „	21 „ 15 „	16 „	1 5 0
7640	18 „	22 „ 19½ „	13½ „	1 5 0
7971*	20 „	20 „ 15 „	18 „	1 11 0

*Patterns marked * have Sockets at back to connect to Retorts; all the others are flanged. Patterns marked B have curved bottoms.* 191

Mouthpieces with D Lids for D Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimension of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
12292	15½ × 13 ins.	15½ × 13 ins.	12 ins.	£1 2 0
9967	16 „ 14 „	16 „ 14 „	15½ „	1 3 0
13574	16½ „ 13½ „	16½ „ 13½ „	12½ „	1 4 0
9899	18 „ 12 „	18 „ 12 „	14 „	1 4 0
12980	16 „ 16 „	16 „ 16 „	18 „	1 6 0
13900	18 „ 13½ „	18 „ 13 „	15 „	1 6 0
9912	18 „ 13½ „	18 „ 13½ „	17 „	1 6 0
9962	18 „ 13½ „	18 „ 13½ „	16 „	1 6 0
10982	18 „ 13½ „	18 „ 14 „	15 „	1 6 0
11098	18 „ 14 „	18 „ 14 „	13 „	1 6 0
9492	20 „ 13 „	20 „ 13 „	15 „	1 10 0
9208	20 „ 13 „	20 „ 13 „	19½ „	1 10 0
10251	20 „ 13 „	20 „ 13 „	15½ „	1 10 0
12964	20 „ 13 „	20 „ 13 „	13½ „	1 10 0
9909	20 „ 13½ „	20 „ 13½ „	17 „	1 10 0
12969	19½ „ 15½ „	19½ „ 15½ „	14 „	1 11 0
13781	20 „ 15 „ Front. / 21 „ 15 „ Back.	21 „ 15 „	15 „	1 11 0
7692	21 „ 15½ „	21 „ 15½ „	16 „	1 11 0
12978	20 „ 16 „	20 „ 16 „	17 „	1 11 0
13252	20 „ 16 „	20 „ 16 „	18 „	1 11 0
13220	21 „ 15 „	21 „ 15 „	17 „	1 11 0
8977	21½ „ 13½ „	21½ „ 13½ „	18½ „	1 11 0
8976	21½ „ 13½ „	21½ „ 13½ „	18½ „	1 12 0
10497	21½ „ 13½ „	21 „ 13½ „	18½ „	1 12 0
8037	21½ „ 13½ „	21½ „ 13½ „	18½ „	1 12 0
9908	21½ „ 13½ „	21½ „ 13½ „	15 „	1 12 0
10404	21½ „ 13½ „	22 „ 14 „	18½ „	1 12 0
12410	21½ „ 13½ „	22 „ 14 „	12 „	1 12 0
13822	21½ „ 13½ „	22 „ 14 „	15 „	1 12 0
10515	22½ „ 12½ „	22½ „ 12½ „	13½ „	1 12 0
7924	24 „ 14 „	24 „ 14 „	15½ „	1 13 0
13807	24 „ 15½ „	24 „ 15½ „	16 „	1 14 0
9015B	25 „ 14 „	25 „ 14 „	12½ „	1 14 0
10932	25 „ 14 „	24 „ 14 „	13½ „	1 15 0
12944B	22 „ 16 „	22 „ 16 „	16 „	1 15 0

Patterns marked B have curved bottoms. 192

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5 „ ..	20 0	10 „ ..	33 0	16 „ ..	46 0	24 „ ..	72 0
6 „ ..	22 10	12 „ ..	38 0	18 „ ..	50 0	36 „ ..	130 0

196

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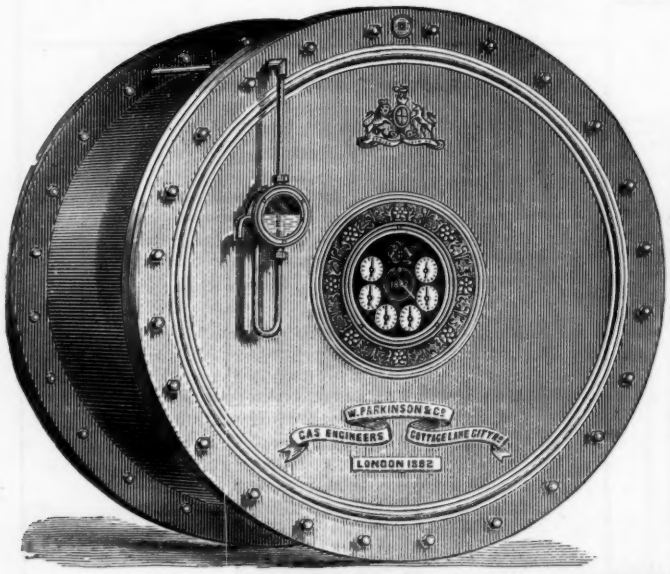

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CONTENTS.

EDITORIAL NOTES—*Gas, Lighting, &c.*:— PAGE
This Christmastide . . . 1195
Inclined Retorts in America . . . 1196
Mr. G. Westinghouse on Fuel Gas . . . 1196
Exhibitions and Awards . . . 1196
Water and Sanitary Affairs:—
Meetings of the Metropolitan Water Companies . . . 1197
The Threatened Coal Porters' Strike and the London Water Supply . . . 1197
The Charge for Water for Business Premises in the City . . . 1197
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 1198
Electric Lighting Memoranda . . . 1198
The Progress of the Strike . . . 1199
NOTES:—
Van Steenbergh Water Gas in London . . . 1200
Flexible Metallic Tubing . . . 1200
Steam and Water Joints . . . 1201
COMMUNICATED ARTICLE:—
The Chemistry of Illuminating Gas. By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S. . . . 1201
REGISTER OF PATENTS:—
Gas-Meters—Price, W. E. . . . 1202
Carburetting Gas—Maxim, H. . . . 1208
Regulating the Supply of Gas to Mains, Pipes, Lamps, Burners, and other Apparatus—Gordon, W. . . . 1204
Patent Notices. . . . 1204
CORRESPONDENCE:—
The Dinsmore Process . . . 1204
The Stokers' Strike . . . 1204
Is Water Gas Possible for British Gas-Works? . . . 1205
PARLIAMENTARY INTELLIGENCE:—
Notices of Applications to the Board of Trade (Session 1890) under the Gas and Water Works Facilities Act, 1870. . . . 1205
Notices of Applications to the Board of Trade under the Electric Lighting Acts, 1882 and 1888 . . . 1206
Notice of an Application to the Local Government Board under the Public Health Act, 1875. . . . 1206
MISCELLANEOUS NEWS:—
Gas Workmen and the Labour Question—
The South Metropolitan Gas Company and their Difficulties . . . 1207
Collapse of the Strikes in Manchester and Salford . . . 1208
The Suffocation of Two Men in a Gasholder at Birmingham . . . 1209
The Deaths of Workmen at the Leeds Forge—The Fatality Due to the Inhalation of Carbonic Oxide Gas . . . 1210
The Sheffield Corporation and the Gas Company . . . 1211
Birmingham Corporation Gas Supply—The Accident at Saltley; Concessions to the Workmen; Cost of Coal; the Lighting of Courts . . . 1211
Lothammer Gas Company, Limited . . . 1212
Meeting of the Chelsea Water-Works Company . . . 1212
Meeting of the Mid-Sussex Water Company, Limited . . . 1213
The Extensions at the Wilton Corporation Gas-Works . . . 1213
The Electric Lighting Scheme for Hastings . . . 1213
Plymouth Corporation Water Supply—The Harter Reservoir Bill . . . 1214
Notes from Scotland. . . . 1214
Current Sales of Gas Products . . . 1215
Gas and Water Companies' Stock and Share List . . . 1215
A New Holder for The Gaslight and Coke Company, 1200—The London Chamber of Commerce and the Settlement of Labour Disputes, 1202—Hexham Local Board and the Gas Company, 1206—The Quality of the Gas at Bristol, 1206—The Birkenhead Corporation and their Trading Powers, 1206—Convictions for Wasting Water, 1206—The Suggested Amalgamation of Manchester and Salford, 1206—A New Pumping-Engine for the Bath Water-Works, 1211—Wakefield Corporation Water Supply, 1211—Accident to a Gas-Main at Newport, Mon., 1211—Explosion at the Preston Gas-Works, 1212—The Lighting of Courts in Manchester, 1212—New Purifying Plant for Workington, 1213—South Normanton Gas-Works, 1213—South Durham Water Scheme, 1214—Proposed Extension of Leeds Gas-Works, 1214—The Gas Consumers' Protective Association, 1215—Sale of Stock in the Harrogate Gas Company, 1215—The Northern Coal Trade, 1215—Mr. A. C. Fraser on Coal Gas, 1215—The Supply of Gas in Small Quantities in Stafford, 1215—Defective Street Lighting at Cardiff, 1215—Burnley Corporation Gas and Water Works Extensions, 1215—The Gas Supply of Rawmarsh, 1216—The Management of the Stafford Corporation Gas Undertaking, 1216—The Condition of the Plympton Water Supply, 1216—Mr. W. Arnott on Coal and its Products, 1216.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 24, 1889.

THIS CHRISTMASTIDE.

IT is now the season of the year when, according to one of the best traditions of our age and race, we are all disposed to indulge thoughts of peace, and to sink animosities between individuals and classes. The idea of a Christmastide spent upona battlefield is singularly repugnant to our sense of the fitness of things. We would prefer, if possible, that all differences between man and man the world over should be composed before the end of the year; because it is a denial of the sufficiency of the ordinance of Peace and Good-will which we then commemorate if a campaign has to be carried on through what should be a holiday time, and renewed with the New Year. Yet it is impossible to close one's eyes to the truths of experience, even for the sake of paying respect to the venerable traditions of Yuletide. A pessimist could easily show that, as year follows year, the proclaimed "Peace on "Earth" seems to grow more difficult of attainment, and to require heavier sacrifices to preserve. What we call peace between the nations is only an armed truce, with no more of the element of true peace in it than there is in the pause that generally precedes the meeting of armies in the field. There are more soldiers on guard throughout the world to-day than ever before. The measure of civilization and progress in Europe may be taken in a variety of ways; but one of these is to be found in the fact that between four and five millions of soldiers are now required to keep the peace over a region once garrisoned by the Romans with about half a million of legionaries. As it is between the nations, so it is in the nations. The strife of class against class, of party against party, of the "have-nots" against the "haves," of the individual against the community that appears to have no room for him—does it grow less bitter year by year? And we, who belong to one of the great industrial orders of this busy country, what do we see in our own ranks now the year is fast closing in? A deep and hopeless quarrel between capital and labour, between engineer and workman, arising in such a way, and attended with such characteristics, as almost to make one despair of the future developments of our industrial civilization.

Here, we have the spectacle of a rich and growing Gas Company—type of all that is wealthy and stable among industrial enterprises—which has been celebrated as a "happy family" among its fellows on account of the good relations, bred of generosity on the one hand and fidelity on the other, subsisting between employers and employed in the concern. There, we see a pair of neighbouring gas undertakings owned by local representative governing bodies, administered with special regard to the benefit of the ratepayers and inhabitants generally of the district. Both these orders of gas undertakings—one belonging to the South Metropolitan, a representative Gas Company; the others to the ratepayers of Manchester and Salford, representing gas-supplying Corporations—are subjected, within a few weeks of each other, to all the waste, annoyance, and distraction of a strike, at the bidding of a mushroom Trade Union Executive, which with a breath was able to blow away all the mutual interest that years of common engagement might be supposed to have created between masters and men. What can we think of it all? It might have been argued that if ever the working man could be expected to be contented anywhere, it was in the employ of the South Metropolitan Gas Company. Here stokers, originally unskilled labourers, received the wages of good mechanics, with every consideration that wealthy employers could show to their servants. The men were well paid for their work in the ordinary way, rewarded for steadiness, looked after in sickness and old age, allowed holidays with pay, and encouraged in everything that could tend to elevate them and render their lives happy. If there was less than this in the way of collateral advantages for the men employed by the Manchester and Salford Corporations, the service was at least preferable to that of any other large employer of unskilled labour in the neighbourhood. In both cases a man who once obtained employment was certain of it, if he behaved well, for the rest of his life. There were no fluctuations of trade to fear, and none of the vicissitudes that attend casual employment to be dreaded. Men worked on year after year with, it is safe to say, less sense of grievance than they would feel in any other employment. Yet what happens? A handful of scheming agitators—some on the look-out for paid offices, some merely carried away by a fatal gift of frothy utterance, some bemuddled with reading Socialistic prints—start a Trade Union for gas workers. They begin very plausibly—declaring that their sole object is to benefit their fellows by applying the powerful leverage of combination. They gain recruits from among the workmen—first by fair appeal to reason; and later, when they feel themselves strong enough, by threats. Then at last these leaders throw off all disguise. They allow it to be seen that the Union does not exist for the workman, but the workman for the Union. They laugh at the fiction that there can be any community of interest between employers and employed. They proclaim Trade Unionism to be the great god for the workman to worship, and will not admit its quality to be subject to discussion. In the name of their idol they perpetrate the most abominable cruelties and tyrannies on those who refuse to bow the knee to it. And the workmen follow them! This is the great wonder. Like sheep, hard-working men, who have never had a really serious grievance, leave employment, and plunge themselves and their wives and

families into unimaginable privations at the bidding of these strangers! Whatever they say is eagerly believed. All the lies, foolishness, malice, and bastard Socialistic rubbish poured forth in the name of Trades Unionism is swallowed. The employer who has tried to make the men's interest his own, who has never told them a lie or failed in a promise in his life, is contemptuously abandoned for the demagogue, the vote-hunter, the catchpenny newspaper writer, and all the fustian crew who have no other aim than to squeeze some trumpery advantage out of their dupes, and afterwards care not if they die in a ditch. What have these time-servers done for the Manchester and Salford stokers? These men and the newspapers supporting them were full of the Manchester and Salford business when it began; but now they never mention it. So with the South Metropolitan strikers. Hundreds of deluded stokers turned out of their employment at the orders of men whose names they hardly knew, and took a mass meeting in exchange for a livelihood.

All this is bitterly disappointing. As well treat men harshly as benevolently, if this is to be their return for kindness. How the Union would have howled if masters anywhere had forbidden their men to join it on pain of dismissal; yet the Unionists only waited to be in the majority to insist on the expulsion of all who declined to enlist in their ranks! It is something to be thankful for that the general public has understood the rights of the cases in point, and supported the efforts of the employers to free themselves and their faithful workers from Trade Union tyranny; but how nearly might it have been otherwise! Those busybodies who met at the Mansion House with a view to effecting a "compromise" between employers and the Union were only discomfited by the fact that the South Metropolitan Gas Directors had a principle to maintain as well as means to maintain it. What would these so-called mediators have done for the poor men driven out of their employ, if the employers had not stood firm? The Manchester and Salford Corporations and the South Metropolitan Gas Directors have conquered the tyranny that masquerades as the Spirit of Trade Unionism, in spite of the laxity which the bonelessness of modern politicians and divines has imported into all questions of principle, and also notwithstanding disunion and jealousy among capitalists of their own order. This latter was plainly demonstrated at the Mansion House conference respecting the claims of the Coal Porters' Union, when all the other employers would have agreed to terms for themselves, leaving the South Metropolitan Gas Company out in the cold.

Amid jealousy, selfishness, and timidity among capitalists, and blind folly manifested by workmen who ought to know better where their true interest lies, this Christmas does not come in very hopefully. What is the use of crying peace when there is no peace, and proffering good-will to those who prefer strife? Capital looks only to its own immediate advantage; labourers are either senseless sheep or ravening wolves, according as opportunity serves; and those who affect to mediate between the two wish in very many cases merely to advertise themselves. What is to be thought of it all? There is only one counsel to be taken to heart by him who seeks only to do what is right, and regards not the consequences. "Be not weary in well-doing," is the message that rings through the ages to all who, in the disappointment of their hopes of benefiting their fellows, come under the temptation to give it up and let things take their course. It is a sad discouragement when good employers seem to be served worse than bad ones as a reward for their efforts to contribute to the solution of the labour question. Yet truth is great and will prevail. A man who does good for hope of gratitude or reward is but a politician, not a man of principle. The philosophy of "let-it-alone" may not find room for the man who simply follows the good he perceives, without fear and without hope; but the cause of humanity is in the charge of such men. Heaven send us more of them, that the Christmastides of the coming years may not seem, more even than the present, to mock the condition of mankind!

INCLINED RETORTS IN AMERICA.

In a recent issue our American contemporary, *Progressive Age*, has some remarks upon the subject of inclined gas-retorts, which we are glad to notice as a great deal more practical and interesting than too much of the matter that finds its way into the gas industry journals of the States. The article instructively criticizes one of our commentaries upon M. Coze's invention; stating truly enough that the question is in the air, and that M. Coze is certainly not alone in the field. We learn from the same source that the combination of inclined retorts with water-gas generators patented by Messrs. Humphreys and Walton Clark, with the object of making water gas out of caking coal, is actually on trial in a works at Jersey City. Here it appears that through retorts are used; the lower ends being without mouthpieces, as they overhang the water-gas generators. The upper ends of the retorts only are provided with mouthpieces, which are much the same as those generally used for horizontal retorts, except that they follow the angle of the inclined retorts to which they belong. Coal is brought in waggons on rails running in front of the bench at about the level of the top of the brickwork. The vertical distance for the discharge of the coal into the retort therefore varies with the situation of the retort; a light curved iron shoot being employed to conduct the coal to the mouthpiece. The angle of the shoot can be varied to alter the momentum of the falling charge, according to its character, whether large or small, dusty, and so forth—a condition which Mr. Clark regards as essential to success. Quickness in drawing and charging is gained by this system; the time occupied for the latter operation being reduced to 17 seconds between opening and closing the lid. The working of this plant is described as quite satisfactory. Our contemporary does not think that the make of gas is increased by the use of these inclined retorts; but, having regard to the saving of time in drawing and charging (which makes the retort-house more productive) and the economy of labour, it is inclined to predict the adoption of inclined retort-settings in all large gas-works. This additional evidence tends to prove that the supposed objections to depending upon gravity for charging retorts are either chimerical or capable of being overcome by simple adjustments of the charging apparatus.

MR. G. WESTINGHOUSE ON FUEL GAS.

A letter on the subject of "Fuel Gas" has been sent to an American newspaper by Mr. George Westinghouse, and is interesting as a disclosure of the writer's latest opinions on this matter. It is known that some years ago Mr. Westinghouse was credited with entertaining an idea of revolutionizing the business of all the native gas companies that he could get hold of. His scheme was to substitute his system of electric lighting for the illuminating part of the gas business, and a system of fuel gas, which he was then elaborating, for the general supply of heat and power. Time has passed away, and although we have learnt all that is necessary about the Westinghouse electric light plant, the fuel gas has somehow lagged in the background. It having occurred to somebody to jog Mr. Westinghouse's memory in regard to this double-barrelled scheme, the letter in question is the result. It admits that a Company formed under Mr. Westinghouse's auspices has been for three years studying the problem of fuel gas, and "the investigations have been carried "sufficiently far to show that a new process for the manu-"facture of gas is not needed to bring its use for heating "purposes within the reach of the many"—which means that the attempt to solve the difficulty by fresh methods has failed. The Company referred to have therefore turned their attention to the improvement of gas heating appliances, with, it is claimed, substantial results. That Mr. Westinghouse should have been driven back to the conclusion that it is hopeless to try to supplant ordinary illuminating gas, even at American prices, with any specialized form of fuel gas, is something worth placing on record. It means the speedy discredit of fuel gas systems, and remitting the question of the utilization of gas for cooking, heating, &c., upon precisely the same footing in the United States as in this country. Mr. Westinghouse spares a patronizing word for the fuel gas enthusiasts now trying to do something for themselves in different American towns, and declares that "there is every "reason to expect that most excellent results will follow "such persistent labours." Three years of it, however, has been long enough for himself; and although the work is still being followed up by his people, "the first importance is "being given to the development of appliances for burning "gas economically." Coal gas is evidently good enough for Mr. Westinghouse to fall back upon; and such a mechanical genius ought to do something notable in the way of developing its fuel capacity.

EXHIBITIONS AND AWARDS.

The close of the Paris Exhibition, and the wholesale reward of everybody connected with this remarkably successful show, by the broadcast distribution of honours and medals, have attracted attention once more to the entire question of prize awards in connection with undertakings of this character.

The French themselves, with their keen sense of the ridiculous, have laughed at this phase of the affair; but something more than a laugh will be required to put the matter on a proper footing. If the idea of exhibitions is not to be wholly discredited, there will have to be a sweeping reform of the prize medal system. It has been seen through for many years by the more keen-sighted; but after this Paris exposure, there can be little hallucination on the subject for anybody. It will be seen that every manufacturing firm enterprising enough to spend money in making an attractive and important show in an exhibition will have a right to a gold medal, or a diploma of honour, according to the scheme of the awards; the next best stands, from the decorative point of view, will be dignified by a silver medal; while the poor displays in the dark corners that saved more expensive wall or floor coverings will get their bronze acknowledgements. Not obtaining a medal or certificate of any kind will merely signify that the exhibitors' show case was regarded as neither useful nor ornamental. The farce of having juries to settle these points will soon cease to be played. A man with a measuring tape will suffice to establish the claims of exhibitors to distinction; and the administrative heads of the undertaking may be trusted to discriminate properly between the more and the less attractive displays. Our contemporary, the *Revue Industrielle*, supports the idea that, instead of the occasional haphazard distributions, distinctions, and awards at international exhibitions, an Order of Merit should be founded for the reward of rich heads of industrial concerns, by means of which recognition would be given to the labour of their workmen, the taste of their designers, the zeal of their foremen, and the talent of their engineers. It is not very clear how the bestowal of a ribbon on the chief of an engineering firm would reflect any distinction on his workpeople; and there would be an obvious difficulty in the case of joint-stock concerns. The notion is not attractive; for if commerce, like virtue, does not bring its own reward, it is hard to see how it can be recompensed. Nevertheless, the suggestion testifies to the widespread dissatisfaction with exhibition distinctions that has been gradually gaining force until it has exploded in irrepressible ridicule over the ribbons, crosses, and medals of the great Paris pleasure fair. The Americans propose to hold an "Exposition" in 1892, which means little more than a design to "go better" than the Frenchmen in 1889. It will, however, puzzle the most acute Yankee to surpass the lavishness with which medals of gold and silver have been scattered on the Champ de Mars; and as the United States has no "Order" of honorific distinction, the "Exposition" managers will be hopelessly distanced from the start, unless they can originate an Order of the Almighty Dollar, or of the Wooden Nutmeg, to suit the occasion.

An arrangement for an amalgamation between the Gas Companies in Lisbon is now under the consideration of the shareholders of the respective undertakings.

Last Thursday, Mr. Francis Roubillac Conder, the well-known civil engineer and scientific writer, died suddenly at Guildford whilst reading in his study. The deceased gentleman was an authority on the deodorization of sewage.

At the usual weekly meeting of the Society of Arts last Wednesday—Sir Henry Roscoe, M.P., F.R.S., in the chair—Sir R. Rawlinson delivered a lecture on "London Sewerage and Sewage." He pleaded earnestly for the purification of the Thames from the great pollution of the London population. He regarded commercial schemes for the utilization of the sewage as doomed to failure. He condemned the proposals for new sludge works; and declared that the best way to deal with the matter would be to bring the south sewage to Barking by a tunnel under the river, and the whole to be sent at once to the great North Sea, and to let reclamation of land and sewage irrigation follow. A discussion followed; but, owing to want of time, it had to be adjourned till after the Christmas holidays.

We learn from a Tasmanian paper which has been forwarded by an esteemed correspondent, that a proposition is on foot for lighting the township of New Norfolk by electricity. A deputation lately waited upon the Premier on the subject, when it was stated that an "eminent electrician" had estimated that he could put down plant for a 4000-candle power scheme for £4000 (£1 per candle power!), which would supply the Government with light for £250 per annum, provided they did not go beyond this limit. Looked at from this distance, and in ignorance of the local difficulties, the scheme appears dear at the price. However, the Premier stated to the deputation that the Government was prepared to take the light from the Norfolk authorities, provided it was shown that it would not cost more than £250 a year. He added that he believed the Treasurer would next year be prepared to place £200 on the estimates for this purpose.

Water and Sanitary Affairs.

Three of the Metropolitan Water Companies have been holding their half-yearly meetings within the last few days. The shareholders of the Chelsea Company, whose proceedings we report in our present issue, may be congratulated on the maintenance of the 9½ per cent. dividend on their ordinary stock—a point reached by them for the first time at the half-yearly meeting in June last. These are not entirely smooth times for the London Water Companies; but there is, nevertheless, a revival of prosperity, after the damage inflicted by adverse legislation. At the meeting of the Southwark and Vauxhall Company, the Chairman (Alderman Sir H. E. Knight) made reference to the "bad times" passed through since 1884. The water rents of that Company now yield a larger revenue than at any previous period, and show an increase of more than £10,000 in the course of the last twelve months. It may be worth remarking that the Company's net water rental went down more than £13,000 in 1885. Since that date there has been an upward tendency, bringing the rental to its former point in the course of 1888. But there has been growth on the other side of the account, in respect to rates and taxes; and these imposts, as levied on the Southwark and Vauxhall Company, have been doubled in their amount within the last ten years—the burden for the half year ending in September last being £9411, or £1000 more than in the corresponding period of last year. Despite a considerable increase in the outlay for coal, and an extra £1000 for cleansing the filter-beds, the dividend of 6 per cent. is maintained; and this is so far satisfactory, though the shareholders would doubtless like to see the dividend not merely stationary, but advancing. The Grand Junction Company are congratulated by their Chairman (Mr. E. G. Fox) as being "in a very happy position"—holding on to their dividend of 9 per cent., with a chance of its growing up into 10 per cent. before very long.

The Chairman of the Chelsea Company (Sir W. H. Wyatt) made an appreciative reference to the public service rendered by the Chairman and Directors of the South Metropolitan Gas Company in maintaining a firm stand against the threats of the gas stokers and their allies. Every Company using coal was declared to owe a debt of gratitude to Mr. Livesey and his colleagues for having defeated the tactics of the Unionists. It appears that the chief anxiety of the Chelsea Company during the last few months—except quite lately—has been concerning the supply of coal; and no doubt the feeling has been largely shared by the other Water Companies. The crisis is now over; but the point has been rather lost sight of by the public, that a failure in the supply of fuel would be tantamount to cutting-off a very considerable portion of the water supply of the Metropolis. The water supply of London is largely dependent on the action of 181 steam-engines, exceeding in the aggregate 21,000-horse power. If these engines were from any cause to cease working, many of the service reservoirs would be speedily exhausted, the deep wells would no longer yield their watery treasure, and the mains over a large area of the Metropolis would in a very short time run dry. Some quantity of water would doubtless be still available, perhaps more especially in the New River district; but the allowance would be a mere mockery of the widespread want. Happily there is no reason to fear such an overwhelming catastrophe. But an actual scarcity of coal might very readily occasion serious inconvenience in regard to the water supply; and it would be well for the public to know that the supply of water to the Metropolis is not quite so easy an enterprise as some people imagine, or as it would be if water would naturally run up hill.

A paragraph in *The Times*, professedly on the subject of "water rates for trade purposes," is found on perusal to be something altogether different, being simply a revival of the old City dispute as to the right of the Water Company to demand a water rental based on the rateable value of premises exclusively used for business purposes. It is asserted that "a great disproportion" exists in such cases between the quantity of water consumed, and the price paid for it. No doubt this is true, just as we pointed out years ago that the sewers rate, in the case of warehouses and merchants' offices, was altogether disproportionate to the quantity of sewage proceeding from such premises. So it is, that the charge for clean water going in is levied on the same basis as for dirty water going out. The drains and sewers are virtually the converse of the water-mains and service-

pipes. The supply of water is not merely a commercial but a sanitary question. The Corporation of the City, not having the water supply in their own hands, have an idea that where the consumption of water is small, it should be supplied by meter; and where the consumption is large, it may still be charged by rateable value, although in the former case the rateable value is great, and in the latter very often diminutive. We must again repeat what we have said in days gone by on this question, that wealthy merchants in the City are trying to get their water supply at an almost nominal price, leaving the Water Companies to gain their principal return from those who are less able to pay. The poor are now supplied cheaply. In the East London district, comparing the total consumption with the net water-rental, the average charge for water is 4d. per 1000 gallons. In the district of the New River Company, which includes the City, the charge is 10d. In East London, the average daily supply of water for domestic purposes is no less than 26¼ gallons per head. In the New River district, the daily average is only 21¼ gallons per head. If the mercant classes are to be relieved, either the burden must be shifted to other shoulders, or the Company must suffer loss. The Water Committee of the Corporation have been debating the question with the Board of the New River Company; and have just reported to the Court of Common Council that the reply of the Company is such as to render it useless to proceed any further. It was also remarked that there was no prospect of getting a Bill passed next session to enable the consumer to be charged by meter instead of on the rateable value. The Water Committee being thus disposed to abandon the subject, at least for the present, the Court of Common Council have resolved to try another Committee. In the meantime, Mr. Archibald Dobbs has rushed into print; sending a letter to *The Times* which has little or nothing to do with the question. In regard to the coming session; it may be noted that the General Powers Bill of the London County Council contains a clause authorizing the expenditure of £5000 on the proposed water inquiry.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1215.)

The volume of business tailed off considerably during the past week, in view of the approaching holidays. People now-a-days seem to be very much in earnest in their play, and make ample preparation for commencing the labours of the leisure hour by reducing work for some time beforehand. The markets have thus become quieter and quieter; and here and there some slight degree of falling off has been experienced for lack of support. But, taking things all round, there is not much to complain of. The Money Market was extraordinarily easy in the earlier part of last week; and it was difficult to find employment for money. But it gained in firmness after the Bank returns were out. In the Gas market, however, events have marched gaily and rapidly; and confidence has been restored in a remarkable degree by the decisive victory gained by the South Metropolitan Company over the labour agitators. For their poor deluded dupes—the workmen—it is, however, at the same time, impossible not to feel profound pity. Prices have accordingly risen more or less considerably—pretty well all along the line. The first to feel the upward influence, and that in the largest degree, were, of course, the Metropolitan Companies. In Gaslights, the "A" is quoted 3 higher; but the prices marked for actual transactions are about level all through the week. The secured issues have commanded good prices; and all the 10 per cent. preferences have risen. South Metropolitans have naturally been most buoyant. "A" is up 5; and "B," 7½. So large indeed is the recovery of the latter, that it now figures as the choicest of all the Metropolitan issues. "A" too has changed hands at top prices. Commercials share in the general advance. In Suburbans and Provincials, the remark we made last week, as to Brentford new being at a tempting price, seems to have justified itself; for the stock has been in demand, and has risen 5. The old, too, is 3 higher. Imperial Continental makes the only show among the Foreign divisions, with a further rise of 2; but this seems good enough to tempt some to take their profits. Water has been a very dull market; and there is nothing to note except that East London has eased off 1. The Lambeth Company's debentures are 1½ higher.

The daily operations were: Gas opened firm on Monday, and business was only moderate throughout the day. Gaslight "A" was marked at top prices; but the quotation did not move. Commercial old rose 3; Brentford new, 2; and Imperial Continental, 1. Buenos Ayres, however, was flat, and fell ½. Tuesday's business in Gas was extremely limited; no considerable issue being dealt in but Gaslight "A," which rose 1. South Metropolitan "A" improved 5; and "B," 4½. Lambeth Water debentures advanced 1½. Wednesday's business was rather more active; and the upward movement in quotations continued in full swing. Gaslight "A" rose 1; "C," "D," and "E," 2; and "J," 1; South Metropolitan "B," 3; and both Brentfords, 3. European, £5 paid, rose ½. Gas was again more active on Thursday, and prices were well maintained, though quotations were not further advanced. Friday was quieter, but progress was made in the advance of prices—Gaslight "A" and "J" and Imperial Continental improving 1 more each. East London Water receded 1.

ELECTRIC LIGHTING MEMORANDA.

A SUBJECT FOR THE LABOUR REFORMER—THE COST OF ARC LAMPS IN THE UNITED STATES—LARGE INCANDESCENT *v.* ARC LAMPS—A SAPIENT SUGGESTION—AN AMERICAN INDICTMENT OF ELECTRIC LIGHTING.

A development of electric lighting by the Westinghouse Machine Company at Pittsburg should attract attention from those who have hitherto been undiscriminating admirers of electricians and all their works. It is reported that this firm, who are manufacturers of railway brakes, high-speed steam-engines, electrical plant, and other specialities of the great George Westinghouse, jun., are fitting up their establishment with a most complete and elaborate lighting plant, with a view to making the premises as nearly as possible independent of daylight. The works are to be rendered as bright by night as by day, if electricity lavishly employed can do it, in order that they may be kept constantly running. Both arc and incandescent lamps will be used—the one to make good the deficiencies of the other. A complete staff of night workmen is to be engaged, to be henceforth continuously employed, so that the establishment shall never stop any more. It is a remarkable incident in modern industrial development. One would like to learn whether it is to become the usual rule of American businesses to work day and night if a sufficiency of artificial light can be procured. Some old-fashioned people will shake their heads over this report, and opine that the world is not getting better through disregarding the accustomed seasons of work and repose. It is by no means certain, however, that the open employment of a double gang of men is not preferable to a constant tendency to work overtime. If the men can be induced to work in this way, there is not much question of right and wrong about the principle. It is a matter of money. It costs money to light up a works like day; and men will not often work by night except for additional pay. Whether these additional expenses of running a factory by night are compensated by the saving of keeping the building and machinery constantly productive, is a matter for consideration. Hitherto it has been generally understood to pay better to enlarge a factory than to work "double tides" on the same ground.

Mr. Raymond, an engineer of Washington, has been conducting an inquiry into the cost of electric lighting in that city. It appears that the local Gas Company charge $20 per annum for a 6 cubic feet street lamp, burning 2600 hours. The price for arc lighting is equivalent to $219 per lamp per annum; 181 lamps being in use, supplied from underground conductors. The Manager of the Electric Lighting Company asserts that the business is "still in its infancy," so that he cannot tell what the arc lamps really cost; but he thinks his Company could not supply at a lower rate than that mentioned. In response, Mr. Raymond has obtained returns of the cost of electric lighting from 336 places, from which it appears that the lowest price is $33 per lamp per year, burning to 12.30 a.m.; while the highest is $280 for all-night lights. From these data it is computed that the minimum price at which an all-night arc lamp can be expected to be obtained in any part of the United States is about 57·6c. per night.

An interesting paper on the comparative advantages of large incandescent and arc lamps was recently read before the South Wales Institute of Engineers by Mr. Sydney F. Walker. The author remarked that hitherto the incandescent lamp has been regarded as more costly in maintainance than the arc lamp, because it requires ten times the energy to show the same result. This applies to small incandescent lamps, of not exceeding 16-candle power. Latterly, however, there has been considerable progress in the manufacture of the "Sunbeam" class of lamps, which, beginning with a short life and low candle power, are now made of from 150 to 3000 candle power, and of fair permanence. These lamps are supposed to alter the question of the comparative advantages of the two systems of lighting. The first cost of the incandescent lamp is less by four-fifths than that of an arc lamp taking the same current. Then the duty of these large incandescent lamps is higher than that of the smaller patterns. Again, a large portion of the light given by arc lamps is wasted, as they have generally to be shaded and unnecessarily multiplied in order to eliminate their deep shadows. For all practical purposes, Mr. Walker asserted that the "Sunbeam" lamps would be found quite as good as the ostensibly cheaper, but really less manageable arc lamps, while they would be distinctly more economical. Certainly some new departure in lamps is needed to give the electric light business a fillip.

As an illustration of the saying that there is no rule without an exception, we may cite the gist of a letter by an anonymous correspondent of the *Electrical Review* on the gas stokers' strike. This production breaks the rule of reticence on the subject that has been prudently kept by all responsible electricians; but not to the credit of the writer. His suggestion is that manufacturers and suppliers of electric lighting portable plant should be prepared for lighting the public streets, if required by insufficiency of gas. The plan recommended is the stringing of cables from lamp-post to lamp-post and the fixing of lamps inside the existing lanterns. The current would be supplied from portable dynamos, or "better

still, by dynamos driven by steam-engines on the spot, such as would be found in saw-mills, &c." The grand conclusion is that the public would undoubtedly be pleased with the light that came to the rescue; "and the comparison between gas and electric lighting would be more strongly brought into notice than ever." Apart from the reassuring fact that there is no opening for such an advertisement of electric lighting as is here suggested, what a splendid specimen of street illumination this electrical genius would offer to the public gaze! Where is the practical electrician who will undertake to do with saw-mill engines, &c., what Mr. Joel at Barnet, and Messrs. Chamberlain and Hookham at Leamington, have not been able to do with all appliances and means to boot—viz., cause the public to forget gas lighting! It is such projects as these that proclaim electric lighting to be still a dream rather than a trade.

The most tremendous indictment of electric lighting which we have ever seen appears in the *Baltimore Sun*, *à propos* of the lighting of New York. Some of the accusations apply to local points, such as the overhead wiring; but much of it is general, and may be recommended to the attention of any English municipality disposed to think that there is anything to be gained by supplanting gas by electricity. "Having solicited the city to use their lights and discard gaslight, upon the ground that they would furnish a better light at less actual cost," we are assured that the electricians have "failed to come up to their promises, and undertake to override the city with a nuisance. The electric lights, while locally more brilliant than the old gaslights, have not "illumined the streets as well. . . . It costs more to light the city; it is not as well done; it is easier to see and chase a thief in districts where gas is used than when the police or pursuers are blinded by electric glares." Common sense is expected to prevail in time, and bring about a "return to the safer and less cumbrous system of gaslights again. When the economy, safety, and comfort of the latter are compared with the menaces and blinding effects of the former, the people will readily acquiesce in a return to the old system." This is how electric lighting is admired in America!

THE PROGRESS OF THE STRIKE.

Matters in connection with the South Metropolitan gas stokers' strike have gone on during the past week with increasing satisfaction to the Company. Curiously enough, although the weather was remarkably fine and mild for the last day or two of the time of the old hands, which enabled the Company to fill all their holders, no sooner had the new gangs come in, than the weather became gloomy with foggy days and nights, thus repeating the experience of the Manchester and Salford Gas Committees. Naturally, the gloomier the days the brighter were the hopes of the strikers; so that although it was so misty on the cold clay bottom of Peckham Rye that their meeting on Sunday afternoon had to be held by torchlight, this circumstance had anything but a depressing effect. It is undeniable that the holders went down very fast during Friday and Saturday nights, although the pressure was pinched to an extent that gave some trouble to the owners of gas-engines in the low-lying districts. So long as the pressure did not fall below ten-tenths, the engines worked as usual, but in some of the back streets in which factories are hidden away all over Lambeth and Southwark, there were hours on the Friday and Saturday when the pressure went down to perhaps four or five tenths, to the detriment of gas-engine power. It should be placed on record, however, that the consumers were so thoroughly in sympathy with the Company that they did not complain of a restriction of supply which they recognized to be prudent while climatic circumstances were so threatening and it was yet uncertain at what rate the new hands in the retort-houses could manage to make gas. Many manufacturers who had been working at night in view of the Christmas holidays, voluntarily ceased the practice in order to avoid embarrassing the Company. The street lamps were not lit until half-an-hour later than the usual time for a few nights, much to the ire of the strikers, who moved several Social Democratic and other workmen's clubs of a political character to protest to the highway authorities against this economy of light.

Meanwhile the new stokers were getting into the way of their work, and the make of gas gained daily. The large gasholder at the Old Kent Road, which forms a landmark for an immense district surrounding this point in the great flat bordering the river, was watched by eager crowds morning and evening. Under its popular name of "Jumbo," this holder grew to be generally accepted as the gauge of the ability of the new stokers. The people inside and outside the works forgot all about the holders at East Greenwich and Kennington Lane, by manipulating which the Engineer could make their pet Jumbo rise or fall at will. There was for them no other reserve but Jumbo; and when day after day his huge bulk rose slowly but surely higher and higher, the sign was regarded as decisive. On Wednesday last, when the representatives of the men had their last interview with the Directors at the Old Kent Road—fruitless, as usual—it was under the shadow of Jumbo, up to his full height for the first time since the commencement of the strike, that the delegates passed out from their bootless errand to the cold comfort of the Strike Committee-Room; and we may be sure that this circumstance did not tend to increase their confidence.

All sorts of desperate expedients have been resorted to by the strike leaders for keeping up the spirits of their dupes. It is pretty well known that when the men handed in their notices, by the orders of their Union authorities, the majority had not the faintest notion that the Company would take them at their word and allow them to go. They had done the same trick twice before, upon different pretexts; and in each case the Company had yielded their demands—with more or less reservation, of course; but still the men had gained substantially what they wanted. They thought the same thing would happen again; but the string had been pulled once too often, and they had to realize as best they might that their much-enduring employers meant to make a stand at last. When it was seen that the stokers would be allowed to depart, a variety of fables were invented by the leaders who had brought matters to this pass. It was confidently asserted that the Company could not hold out for twenty-four hours; and that in order to delude their own hands and the public the Engineers had filled the holders with air instead of gas. The importation of provisions and the erection of sheds with sleeping accommodation in the works had been looked upon by the men as only the Company's hand in the game of "brag" which they supposed they were playing. Up to the very last the men in many instances could not bring themselves to believe that all these preparations meant business. After all, they had a child-like faith in the fighting powers of their own loud-mouthed leaders; and the General Secretary of the Union doubtless expressed the belief of the mass of his followers when, in the posters which he issued warning working men to keep away from the gas-works and to disbelieve the Company's recruiting agents, he stated that the strike could not last four days.

It is to be hoped that the Directors of the South Metropolitan Company will have the story of the strike specially compiled for the guidance of other employers of labour who may be similarly threatened. Every one of the responsible officers upon whom has fallen the duty of fighting the Union—whether as works' manager, labour agent, or commissariat officer—should report his own proceedings in detail; and the commander-in-chief, Mr. George Livesey, should tell the whole tale of the campaign in a special Head-Quarters' report to which the departmental reports would be supplementary. Not otherwise will the momentous struggle be understood. Apart from their fables, which can be easily dealt with, the Unionists will keep their side of the subject well to the front, and after a short time will endeavour to twist the history of the great strike in their favour, if no other record than the newspaper one exists to the contrary. With regard to the delusive reports spread by the Union leaders after the strike had fairly begun, these may be said to have related to matters both outside and inside the works. They pretended that the new hands could not make gas, that they would do all sorts of mischief in the works, that their presence created a risk of fire and explosion, that they could not stand the heat, that they would burn their hands, that they had to be enticed to work by means of unlimited beer, that their treatment was such that a strong force of police had to be maintained to prevent them from breaking out of the works, and so on *ad nauseam*. It was endeavoured to make a great deal of capital out of the supply of beer to the men, seeing that the Chairman, the Chief Engineer, and the Works Foreman at the Old Kent Road are notorious teetotallers, Good Templars, and what not in the same line. It was carefully ignored that the supreme authority in the matter of victualling as of everything else, is the Board of Directors; who wisely refrained from hampering themselves by insisting upon their new recruits relinquishing their wonted beer, but took the wise course of providing good, sound malt liquor for those who wished for it, and issuing it in strictly limited rations. Practically, neither Mr. George nor Mr. Frank Livesey had anything to do with this matter, which need not be further discussed. As to the idea of the new men not being able to make gas, those who made so much of this argument forgot that men are not born stokers. Every man who left the Company's service had had a beginning; and if he was longer than a week in picking up the knack he probably heard about it from his impatient mates. Within three days the style in which the new hands drove the scoops was in many cases undistinguishable from that of the old stokers; their awkwardness betraying itself more conspicuously in the drawing. It has taken them some days to acquire the swing of the rake; but the foremen are always ready to help them, and they are eager to do their work like men. Skulkers there are among them, doubtless; but the process of weeding is facile. The majority appear to be thoroughly convinced that taking service with the Company was the best day's work they ever did in their lives; and it is impossible but that, with so many to choose from, the foremen will succeed in making up a capital set of retort-house hands. One of the strikers who managed to get into the Old Kent Road works with a view to seducing the new hands was by them unceremoniously rushed off the premises, without troubling the police, having thus taken nothing by his hazardous notion. A few processions from one station to another amused the strike hands during the week and kept the police on the alert; but these efforts counted for nothing, and the men's collecting boxes were of little use in face of the general public condemnation with which the strike is regarded.

From the commencement of the agitation, it was perceived that the full force of the storm would break upon the Vauxhall station, if anywhere, on account of the proximity of Nine Elms, where the second largest branch of the Union has its head-quarters. The two stations being only ten minutes' walk apart, it was easy for the men coming from Nine Elms to "demonstrate" at Vauxhall three times a day, if they were so ordered, when the different

shifts went off. At any rate, Major Gilbert, the experienced head of the Southern Division of Police, took personal care of this centre of disturbance, upon which a strong force of mounted constables could always be concentrated at short notice. The strikers had a wholesome dread of the horsemen; and so they generally kept clear of them, prudently retiring into the safety of neighbouring taverns, whence they fulminated denunciations of the Government for making this "unnecessary display of force," and called on the constituents of the Home Secretary to remember this villainy at the next general election. Mr. Carpenter has had an arduous task in providing for his men inside his station, which is one of the most crowded and cramped in London. Ability to withstand a blockade has not hitherto been considered by the designers of London gas-works; and few are conveniently arranged for such an emergency. Vauxhall is closely packed with buildings and apparatus for gas making, and there is only a corner for the refectories and dormitories required for the 700 men or thereabouts whom Mr. Carpenter has had to feed and house. Unlike the other Station Managers, Mr. Carpenter has adhered to the eight-hour system in organizing his men. Elsewhere they are being broken in to the work on the twelve-hour system first, and will be redistributed into three gangs when sufficiently expert. Mr. Carpenter's system in the commissariat department is very methodical, every man being provided with a daily ticket for all he needs. With all this method, however, the exigencies of space are very troublesome. Not the smallest trouble here, as at the other stations, has arisen out of the superfluity of hands. At one time Mr. Carpenter had three times as many as he wanted, and hardly knew what to do with them. At Vauxhall as elsewhere the outgoing gangs played many vile tricks with the tools and plant, to annoy the foremen and the new-comers. Mr. Carpenter avows that he would not willingly again go through the trouble he has endured since the concession of the eight-hour system. He took the view that we did at the time—that the system was not likely to prove a good one in the end for the average London gas stoker, who found himself turned out of the works at two o'clock in the day with nothing to do until six the following morning. Whether what has since happened is a further proof of the truth of Dr. Watts's line which tells that "Satan finds some mischief still for idle hands to do" is not for us to say. Having obtained the eight-hour day, however, it remains a fact that the South Metropolitan stokers, and particularly as it would seem those employed at Vauxhall, went all wrong, in the idea that they had only to ask and have. The net result of the long agitation, as expressed by Mr. Carpenter for his own works, is that the whole year has been lost. There has been no opportunity for improvement in any direction. So far as gas engineering is concerned, Mr. Carpenter declares that "he feels as though the season had been blotted out of his life." The works are precisely as they were this time last year—which is a saddening reflection to a progressive manager—and all through the men. Evidently at all costs it was high time to stamp out disaffection from the South Metropolitan works; and at present it looks as if the result would be such as to justify the cost and trouble.

A word or two may be recorded with regard to the coal supply. To boycott the Company in the matter of coal was the last resource of the strike leaders; but after a day or two of transient hindrance at the end of the week, due to the refusal of some of the usual coal porters to work the Company's ships then in dock, the difficulty was overcome in the usual way. A strong gang of navvies was marched down to the docks; and after the remonstrances of the pickets had been replied to by a significant handling of shovels and a few pithy remarks on the folly of men who throw up good work for a fancy, the navvies broke the bulk of the coal, and this conspiracy was at an end. The barges were unloaded at the up-river stations by some of the new hands. There has been some loud talk of stopping the running of ships to the Thames by a coalition between the Coal Porters and the Seamen's and Firemen's Unions; but it is not likely to come to anything, as the Company are fully determined to keep their district lighted, even if they have to charter German ships and buy foreign coal to do it.

A New Holder for The Gaslight and Coke Company.—Last Wednesday, the new holder which has been for some time in course of construction at the Bethnal Green Station of The Gaslight and Coke Company was brought into use for the first time; the ceremony of turning in the gas being performed by Mrs. Trewby in the presence of a good number of friends. The holder, which is the largest that has been erected by the Company, was designed by Mr. G. C. Trewby, the Chief Engineer. It is constructed in three lifts, each 50 feet deep, has a working capacity of 4½ million cubic feet, and floats in a concrete tank 200 feet in diameter and 50 feet in depth. It is principally of steel, and was constructed by Messrs. S. Cutler and Sons, of Millwall; the builders of the tank being Messrs. Aird and Ellis, of Lambeth. The gas to be stored in this holder will be drawn from Beckton; the necessary exhausting machinery, capable of passing 500,000 cubic feet of gas per hour, having been erected by Messrs. Bryan Donkin and Co., Limited, of Bermondsey. Mrs. Trewby, having opened the inlet-valve, said she hoped the new holder would be as successful in its working career as it had been in its construction. Mr. Trewby expressed his entire satisfaction at the manner in which the whole undertaking had been carried out, and his gratification at knowing that during its progress no serious accident had occurred. A vote of thanks was passed to Mrs. Trewby for taking part in the ceremony.

Notes.

Van Steenbergh Water Gas in London.

The Van Steenbergh water gas plant at Humphreys Hall, Knightsbridge, is now in full working order; and Professor Vivian B. Lewes is busy with the tests and analyses which he has undertaken to make of the water gas produced by this apparatus. It is not intended to exhibit the apparatus to the general public until Professor Lewes has been able to determine what it is capable of doing. The gas is being used already, however, in lighting the hall and the street-lamps in front of it, and has a very attractive appearance. It is apparently of from 20 to 22 candle power, made from ordinary gas-works coke carburetted with a light naphtha. The light is very white in comparison with the common London coal gas, and burns readily in any kind of burner. In general character it looks more like the flame of so-called air gas than of common coal gas; but it differs from the former in its capacity for clinging to the burner and thus being capable of burning as an exposed flat flame. It appears to be quite as reliable in this respect as ordinary coal gas, and just as difficult to blow out. It has a distinct odour, due wholly to the process of carburetting; for there is nothing in the water gas to smell apart from the naphtha which is blended with it. So far as can be seen, the gas is fairly permanent when made. Altogether it is a "pretty gas," as American engineers are in the habit of saying of it; and great interest will attach to Professor Lewes's report upon its nature and properties, and the cost at which it can be made in England.

Flexible Metallic Tubing.

The great utility of flexible tubing is recognized alike by gas engineers and gas consumers who have occasion for a temporary supply of gas in a spot to which the ordinary gas-pipes have not been laid; and, valuable as is the rubber tubing ordinarily used for this purpose, its liability to injury is certainly to its disadvantage. It is on this account, as well as for its practical usefulness, that the metallic tubing manufactured by the Flexible Metallic Tubing Company, which is shown in the accompanying illustrations, is having a considerable amount of attention. It will be seen that the tube is made from a continuous strip of metal pressed into a section something like a letter S, and that this continuous strip is coiled upon itself in such a way that the parts of its

FIG. 1

FIG. 2

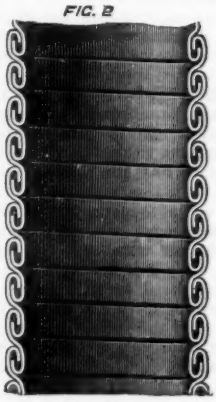
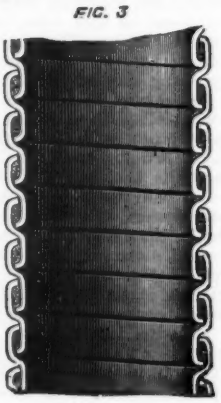


FIG. 3



section interlock. Fig. 1 is a view of a piece of ½-inch tube; figs. 2 and 3 are sections of 1-inch tubes. The form of the section shown at fig. 3 is that adopted for tubes requiring a good deal of flexibility, as it leaves a slight space between the edge of the strip or spiral coil on one edge, and the space in the groove into which it fits, for the introduction of a continuous thin thread of india-rubber of fine quality. This is automatically fed into the spiral coil as it is made. It is completely encased, and makes the tube quite tight when considerably bent, and for gases and liquids under small pressure. For steam and for water under very heavy pressures, the section shown at fig. 2 is used. The flexibility of this section is not so great, although it is sufficient for most purposes; and the liquid under pressure causes the coils to press tightly together, and make themselves perfectly tight. The tube is about the same weight as india-rubber tube of the same strength, and is made by continuous-action machinery at a very great speed. The Company have lately opened new show-rooms at No. 52, Queen Victoria Street, E.C.; and we recently visited them to ascertain what advance had been made in the construction of this really extraordinary tubing since its introduction in 1886. We learnt that both larger and smaller sizes than those shown had been manufactured. They now make ¼-inch brass tubing which can be easily bent to a circle 4 inches in diameter. On the other hand, they have 2-inch tubing which would make a boy's hoop; and a still larger size (4½ inch) which could be bent to an almost similar curvature. The tubing is made in copper, bronze, and steel; also n brass and iron. Some is silver plated, adaptable for connecting

heating-stoves in drawing-rooms, shampooing-saloons, or restaurants. When it is remembered that this tubing stands a pressure of 250 lbs., can be walked upon by a person without indentation, and is gas and water tight at any curvature, it may, we think, with justice, lay claim to being one of the cleverest inventions in this inventive age. At any rate, it is an invention that will continue to force its way into the favour of gas engineers. We understand that the tubing will shortly be manufactured for hydraulic purposes.

STEAM AND WATER JOINTS.

A prize paper on steam and water joints in the *Mechanical World* states that for high-pressure steam-cylinder cover joints, asbestos millboard is the best packing, smeared with plumbago, or a mixture of plumbago and tallow, on each face. For joints of this class, which are required to be broken occasionally, the asbestos millboard, prepared in this way, is excellent, as it lasts a fairly long time, and does not stick to the metal. Red-lead putty is objectionable for these joints, as it sets so hard. Low-pressure cylinder covers may be made with hard lamp-wick soaked in paint or cylinder oil. The only objection to asbestos millboard for these purposes is the expense. Asbestos rings are recommended for steam-pipe flange joints, whether "spigoted," as for hydraulic work, or plain. Plain flanges having a large number of small bolts are to be preferred to those with a small number of large bolts. Asbestos should not be put between copper and iron flanges, as it is apt to become saturated with moisture and facilitate galvanic action. Wire gauze and red lead are materials to be used in such cases. India-rubber covered with canvas may be employed for flanges easy of access, which can be screwed up as the rubber softens with the heat. It must be well greased with plumbago and tallow, and the flange faces cleaned and filed flat before application. Where a joint is in such a situation that it can only be got at when steam is let down, the best plan is to use brass wire gauze and red-lead putty. All cocks on the boiler should be made with this joint. Two thicknesses of the wire gauze should be used, both covered each side with a thin layer of stiff red-lead putty. For pump flanges and all other plain flanged joints under water pressure, the best material is india-rubber covered with wire gauze, or, failing this, with canvas; in either case well dressed with plumbago and tallow. Hydraulic joints are made with india-rubber rings.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

XXXV.

An important paper on the manufacture of illuminating gas from paraffin oil was read before the Royal Scottish Society of Arts by Dr. Stevenson Macadam in 1882.* He stated that for several years past his attention had been repeatedly drawn to the subject of the production of gas of a permanent quality from these oils. At the commencement, the experiments were not very satisfactory owing to the varying quality of the oil; but later on, by working with special kinds of oil which had to some extent undergone purification, and by paying attention to the question of the temperatures at which these oils were subjected to destructive distillation, he obtained reliable results. He had employed the crude oil which first came over in the distillation of shale for the purpose of making permanent gas, and had also taken it as a sort of standard as to the quality of the gas obtained from the other oils. If the crude oil was distilled and the volatile spirit removed from the distillate, green oil was obtained; and this, when rectified by the employment of acids and alkalies, so as to remove the tar bases, and treated for burning oil, intermediate oil, and solid paraffin, yielded a residue known as blue oil. An extremely volatile spirit known as gasoline was extracted from the first distillate of crude oil; but it was so combustible and explosive as to be unsuitable for the preparation of gas. An oil suitable for gas making should be thin enough to run readily into the retort at ordinary temperatures; and regard should be had to the specific gravity, and to the flashing and firing points. As to the method of working, he kept the retort at a cherry-red heat, for which purpose some little skill was necessary, just as with a coal-gas retort. The oil was supplied to the retort from a suitable reservoir through a long syphon tube, so as to prevent the gas being driven back, and the supply of oil could be easily regulated. Working in this manner no difficulty arose. The retorts kept wonderfully clean; and after working one for a whole day there would only be a little deposit of soot. He obtained the following practical results:—

	Crude Oil.	Green Oil.	Blue Oil.
Cubic feet of gas per gallon .	98·7 .	102·5 .	127·4
,, ,, per ton	26,026 .	25,977 .	32,492
Candle power of 5 c. ft. . .	50·4 .	53·2 .	54·3

About 80 per cent. of the quantity of light that would be obtained by burning the oil in lamps of the best construction was represented by these quantities of gas; and the cost of a ton of crude oil was £4 18s. 10d., or something less than 4s. per 1000 cubic feet of 50-candle gas. The crude oil had the disadvantage of a low flashing point—92° Fahr. The green oil, having had the more volatile constituents extracted, was better. It flashed at 165° Fahr., and fired at 193° Fahr. It could be obtained for 7d. per gallon, or £7 9s. per ton. The blue oil was heavy, but fluid at ordinary temperatures, and, of course, more expensive. Dr. Macadam had also worked with a number of other oils; but had not obtained satisfactory results either in regard to quality or quantity. The heavier oils obtained by the destructive distillation of coal were included in this category. The best result obtained from them was 95 cubic feet of 42-candle gas per gallon, or 25,000 cubic feet per ton. The manufacture of oil gas was much simpler than that of coal gas. No scrubbers or purifiers were needed. The gas was simply passed through the condensers, where a little tar separated, and then it was conveyed to the gasholders, and was quite permanent.

In a communication to the JOURNAL a year or two later,* Mr. Ivison Macadam mentions the important fact that gas made from "crude oil as obtained from shale, or semi-refined varieties, such as the so-called blue or green oil," is much contaminated with sulphur and ammonia compounds, and with carbonic anhydride. It may here be remarked that there is considerable divergence on this point. As just noticed, Dr. Stevenson Macadam infers that the oil gas needs no purification. As a matter of fact, it is usual to subject oil gas, in practice, to the action of a scrubber and a lime purifier, even when secondary products are used; so we may safely infer that this would be indispensable in the case of crude oil, or crude petroleum. If the gas is to be used for buoys, railway trains, &c., the impurities may remain; but he considers it necessary that they should be removed if the gas is to be distributed in the ordinary way. He therefore suggests the employment of purer oils as a means of avoiding the expense of purification. He then describes the apparatus patented by Mr. Paterson, which simply consists of a number of tubes carried through the lid of an ordinary horizontal retort, nearly to the back end. The fluid is fed into these tubes, and is vaporized as it passes along them. The vapour, in the course of its return journey from the back to the front of the retort, is converted into permanent gas. The conversion is not complete, as a quantity of oil is deposited in the condensers; and it is so far charged with soot that it cannot be used again. But the results are very satisfactory; 100 cubic feet of 60-candle gas being readily obtained from ordinary burning oil. In this gas there are about 36 per cent. of olefines condensible by bromine; and the carbonic anhydride does not exceed 1·4 per cent. The proportion of this impurity would, however, depend upon the quality of the oil used. Reckoning the oil at 6d. per gallon, and the manufacturing charges at 1s., the cost of 1000 cubic feet of oil gas would be 6s. But in comparing this with ordinary coal gas, the quality must be considered. Bulk for bulk, the oil gas would be dearer; but when the 60-candle oil gas is compared with 16 or 20 candle coal gas, it is much cheaper, light for light.

At a later period, this gentleman read a paper before the Glasgow and Scottish Section of the Society of Chemical Industry,† comprising a description of practical tests conducted upon several kinds of oil obtained in the Scottish shale industry, and one test of ordinary American petroleum. The results obtained are considerably higher than those already indicated, which may be due to improved apparatus, and also to the use of a burner suited to the consumption of these high quality gases, at the photometer. In the course of the discussion which followed the reading of the paper, Dr. Wallace asked if the author had tried ordinary crude oil from blast furnace tar. A trial of this substance made by himself did not afford very promising results. It gave a large proportion of tar in the condenser, about one-third of the whole, and exhibited a tendency to choke up the pipes and to deposit carbon in the retorts. This oil was very cheap; and if it could be conveniently applied, it might well be used in conjunction with common coal as a means of producing gas equal to cannel gas—say, 22 to 26 candle power. This subject was daily increasing in importance, because the cannel coal fields, particularly those of the better class, were being rapidly worked out, and some gas suppliers had even thought of reducing the quality of their gas, in view of the difficulties that might be experienced in the obtaining of supplies of first or even second class coal. Mr. W. Foulis criticized the Paterson apparatus. He thought the small tubes would be likely to get choked, and that being fixtures, they would interfere with the removal from the retort of the carbon that would undoubtedly accumulate. He also suggested the use of a jet of steam in conjunction with the oil. A simple apparatus on this principle was used in America in ordinary retorts, and being attached to the lid, it could be taken away or brought into use, as might be desired, in a few minutes. It consisted of a tube attached to the mouthpiece and extending nearly to the back of the retort. Inside it was an inner tube, into which the oil was blown by a jet of steam. Escaping from this, the vapour and steam passed down the outer tube to the back of the retort, and were converted into permanent gas in coming forward to the ascension-pipe. Professor Mills asked how long the retort would run without cleaning, and also as to the quantity of fuel required to maintain the high temperature at which it was worked. Mr. Macadam, said he had not obtained satisfactory results, or figures of any practical value, with blast furnace tar; and he did not think the Paterson apparatus would give good results with such oils. The rectified coal oil used in his experiments was obtained from ordinary coke ovens. Though the tubes in the retort might at first sight appear an objection to a practical man, he had worked with them for some months without choking; and the apparatus had been in the hands of ordinary workmen, in no way specially skilled. The tubes were attached to

* See JOURNAL, Vol. XL., p. 1082.

* See Vol. XLV., p. 1204. † *Ibid.*, Vol. XLIX., p. 856.

the door of the retort, and could be removed with it; so they could scarcely be regarded as fixtures. It was seldom that cleaning was required, but when necessary, it could very easily be done. He had made some experiments with the use of a jet of steam, and would bring forward his results on a future occasion. The gas had been rigorously experimented upon in regard to permanency, and proved to be quite as permanent as the coal gas supplied in Edinburgh. Although the tar contained a large proportion of naphthalene, it must be remembered that the proportion of tar was small; and he could not say if there was much naphthalene in the gas. He could not at the moment give the cost of the gas.

The preceding, together with some other matter relative to the subject of gas making from oil, invoked an editorial article in the JOURNAL* presenting other phases of the matter which should not be passed unnoticed. While admitting that experiments of this kind are deserving of every encouragement, as it is impossible to learn too much about the gas-making properties of mineral oils, especially as throwing a side light on some of the obscurities of coal gas manufacture and purification, it was submitted that there is a wide chasm to be bridged before the system of oil gas making can be worked in practice on a large scale. Professor Macadam's results were obtained from iron retorts worked at moderate heats; and there seemed to be a general idea that these liquid hydrocarbons needed only a moderate heat to gasify them, and further that this heat should be applied by degrees, so as first to convert the oil into vapour, and then to "fix" the vapour as a permanent gas. The experience of gas engineers who had had occasion to carbonize oil in ordinary gas-works did not agree with this, as they found that the hottest clay retorts were best for the purpose. The residual deposit of carbon was the *crux* of oil gas making. Professor Macadam admitted that at least three-eighths of the burning oil remained in forms other than gas; and it might be assumed that carbon accounted for a considerable portion of the loss. The carbon deposit troubled the early American carbonizers of oil, and finally convinced them that they were working on the wrong principle. As soon as the oil met the heated surface, the more volatile portion passed off as vapour. The "fixing" of this vapour was attended with some formation of carbon, which was deposited in the retort. The liquid that remained was found to be heavier, richer in carbon, more difficult to gasify, and left a considerable deposit of carbon. So the result was a rapid accumulation of carbon, especially where the liquid entered the retort, but also upon all parts of the heated surface. In the iron retort, comparatively little deposit would be formed at first; but as it deposited, it would form a coating on the interior surface of the retort, like boiler scale, which would reduce the temperature to which the fluid was exposed. After a time the foul retort would not give more than half as much gas as was obtained at the commencement. Many attempts had been made to get over this deposit of carbon—such as filling the retort with thin sheet or scrap iron; but the fact remains as one of the gravest evidences against mineral oil gas, that the direct carbonization of oil from gas has been abandoned in the United States after repeated trials. These attempts had discovered the two principles that the oil must be gasified at the highest possible temperature, and that contact of the fluid with the interior surface of the retort should be avoided as far as possible. This might be accomplished by injecting the charge in a spray sufficiently fine to be gasified by radiant heat before it could touch the sides.

THE LONDON CHAMBER OF COMMERCE AND THE SETTLEMENT OF LABOUR DISPUTES.—A Committee of the London Chamber of Commerce, with Mr. S. B. Boulton as Chairman, and Mr. K. B. Murray as Secretary, have lately been considering the subject of conciliation in the settlement of labour disputes. A scheme has been laid before them by the Chairman, and discussed with the assistance of representative gentlemen who were invited to express their views thereon; and it has also been submitted to various bodies of working men, both at council and at public meetings. The Committee's proposals are briefly as follows:—The appointment of a Permanent Committee, representative of both capital and labour, to deal with questions arising out of labour disputes in the Port of London and in the Metropolitan district. This Committee is to be composed of members of the Council of the Chamber of Commerce and of such gentlemen of influence and experience as may be useful in promoting the settlement of such disputes. In the event of any difficulty arising between capital and labour, the rooms of the Chamber of Commerce are to be placed at the disposal of the disputants, and the services of the Committee are to be available in the settlement of the differences between them. It is proposed that the Committee shall endeavour to promote the formation, among the various trades of London, of Councils of Conciliation, to be composed of employers and workmen; such Councils to be affiliated to the Chamber of Commerce. The Committee above referred to have lately been strengthened in number by the addition of His Eminence Cardinal Manning, the Lord Mayor, and his predecessor in office (Sir J. Whitehead, Bart.); and they have just made their first report, embodying the scheme of which an outline is given above, and which has been provisionally adopted by the Council of the Chamber. The Committee venture to think that the creation of a responsible body such as that suggested would be the means of preventing many labour disputes reaching an acute stage, and of obviating the disagreeable consequences to trade generally which result from such troubles.

* See Vol. XLIX., p. 898.

Register of Patents.

GAS-METERS.—Price, W. E., of Hampton Wick. No. 164; Jan. 4, 1889. [11d.]

This is an improvement on patent No. 15,410 of 1887. Instead of cutting off the supply of gas, by means of a valve, when the quantity paid for has been consumed, according to this invention the further supply is prevented by stopping the revolution of the mechanism of the meter, by causing a stop-piece, catch, or the like, to be brought into the path of some one of the moving parts—preferably that of the horizontal arm which is mounted on and drives the vertical shaft carrying the tangent screw which in dry meters gives motion to the counting mechanism. The stop-piece or catch may conveniently be placed on the horizontal spindle which carries the arm that is operated by the coin; and the patentee prefers to attach to such spindle a weighted arm instead of the coiled spring described in the former patent. By so adjusting the arrangement and movement of the stop-piece that it may at first come only partially into the path of the horizontal arm, and may retard without stopping it as it passes for several revolutions before it actually stops it, the gas lights may be made to sink for a few seconds at each revolution of the mechanism, and thus give notice of the approaching exhaustion of the quantity of gas which has been paid for. In wet meters the arrangement of the stop-piece or catch must be so modified as to come into contact with an arm fixed to the axle of the drum or to a part moving therewith.

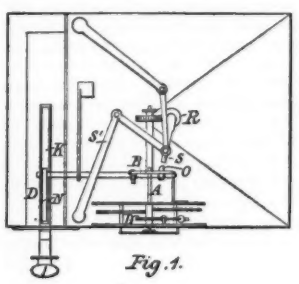


Fig. 1.

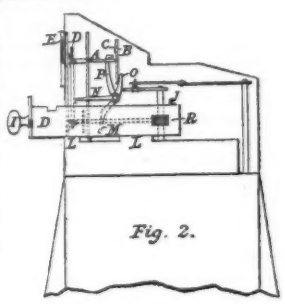


Fig. 2.

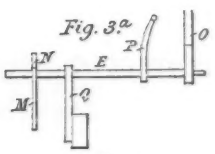


Fig. 3a.

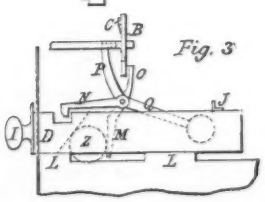


Fig. 3

Fig. 1 is a sectional plan of a dry gas-meter constructed according to this invention; and fig. 2 is a cross section of same. Fig. 3 is an enlarged sectional view showing the parts forming the essential features of the invention; and fig. 3*a* is an elevation of the spindle and arms forming part of the same.

The general construction and arrangement of the meter is essentially the same as that described in the 1887 patent, with the exception of the valve for controlling the passage of the gas and the parts having relation thereto—that is to say the slide D for the reception of the coin together with its accessories, the rotating disc or table B and the arm P and the pin, are the same and have the same action as described in the former patent. A is a horizontal shaft or spindle carrying the pointer E of the upper dial, the wheel D, and table B. The counting wheels of the meter are connected to and driven by the ordinary moving parts in the usual manner, and are connected with the wheel D either by the arrangement shown in the former patent or by any train of wheels by which the rate of rotation of the shaft A and consequently the table B is made to correspond with the passage of one unit quantity of gas—say, for example, 300 feet, or such other quantity as corresponds with the coin the meter is made to receive. D is the slide for the insertion of the coin; I, the knob, by which the same may be drawn out; and K, a slot in the slide for the reception of the coin. J is a stud which limits the distance to which the slide can be drawn out, and consequently the size of the coin that can be inserted. Under the slide D is the drawer into which the coins drop when they are liberated from the slide by the moving backwards of the arm M.

E is a shaft or spindle carrying the arms M, N, O, P, Q by means of which the motions of various parts are operated or controlled; the last-named carrying a weight. When a coin of the proper size is inserted in the slot K and the slide D is pushed home, the coin is carried against the tail-piece M, which it pushes backwards, and is itself pressed downward by the obliquely cut ending of the slot shown by a dotted line in fig. 3, until it assumes the position shown, where it is retained by the pressure of the tail-piece holding it against the end of the slot L in the partition, until it is released. When the tail-piece is thus pushed back by the coin, the arm N which moves with it, is brought downwards so as to engage with a notch, thereby preventing the slide D being drawn out so long as the coin remains in the position indicated. The arm P carries at its end a pin, and the disc B has a hole through it, into which this pin drops when the gas which has been paid for is consumed. The surface of the disc towards one side of the hole may be inclined so

that the pin, as the hole approaches it, may at first sink gradually—thus bringing the arm or stop-piece O at first partially, and afterwards (when the pin passes through the hole) completely, into the path of the moving part it is intended to stop. S is an arm mounted on, and revolving with, the vertical spindle carrying the tangent screw R, and which is connected with and driven by the bellows of the meter by arms and links in the manner usual in dry meters.

When gas is being consumed the disc B in the course of its rotation brings the hole already referred to in front of the pin; and when this happens the latter, being pressed forward by the action of the weight, passes through the hole and allows the arm P to advance by the length of the pin, carrying with it the stop or arm O which thereby comes in the path of the arm S and prevents its further onward motion—stopping the meter and therewith the flow of gas.

As previously stated, the part of the disc which passes under the pin immediately in advance of the hole, is made to incline towards the hole, so that as this part of the disc passes, the pin is allowed to advance slowly for a distance equal to about two-thirds of thickness of the disc, thereby advancing the stop O to a corresponding extent. This advance of the stop is just sufficient to allow the arm S to come in contact with its surface, which is presented somewhat obliquely in reference to the direction of motion of the arm, as shown in Fig. 1. Thus the end of the arm rubs against the stop O, and pushes it back far enough to enable the arm S to pass. But in doing this the motion of the arm is retarded so much that the flow of gas is lessened and the flames at the burners sink slightly on the first occasion, but to an increasing extent with each succeeding revolution of the arm, until the pin drops into the hole, and the stop O passes so far forward that the arm on its next revolution strikes the side of the stop fully and is stopped.

On an appropriate coin being inserted in the slot K in the slide D and the slide pushed home, the arms M and N are operated as before described; the pin drawn back out of the hole; and the stop O removed out of the path of the arm S—the latter being thereby allowed to pass, and gas is thus allowed to flow through the meter.

The meter thus started, the passage of the gas as it is consumed causes the rotation of the disc B, on the surface of which is a projection or cam C, one part of which rises at a gentle incline from the surface of the disc, and the other end of which may terminate abruptly so that (as the revolution of the disc proceeds) the inclined surface of the cam soon comes in contact with the pin and pushes it back further than it was carried by the action of the coin, and in this way removes the arm M from contact with the coin and allows the latter to fall through into the drawer beneath. As the disc continues to revolve, the cam passes from under the pin, and the pin advances so as to be in contact with the surface of the disc. The other arms moving similarly, the arm M is raised out of the notch, leaving the slide free to be drawn out, and the arm M in position to be operated by the next inserted coin. If now another coin is inserted, the arm P is moved back just far enough to lift the pin off the surface of the disc, so that when the hole passes in front of it, the pin remains held back by the coin, but when the hole has passed-by, and the cam C passes in front of the pin, it again pushes it back and releases the coin.

Carburetting Gas.—Maxim, H., of Crayford, Kent. No, 703; Jan. 14, 1889. [8d.]

The main object of this invention is to provide for the manufacture of carburetted coal gas in proportion to the consumption thereof, "in such a manner as to ensure its being of equal or uniform density, notwithstanding any variations in the number of burners in use, the length of time during which such burners are used, the quality of the liquid hydrocarbon employed, or the temperature of the surrounding air."

Fig. 1 is a vertical central section of one form of carburetter; and fig. 2 is a transverse section. Fig. 3 is a sectional elevation of the tank or reservoir for the liquid hydrocarbon and the manner of connecting the carburetter therewith.

A is a chamber or casing closed at its upper end, and to the lower end of which is secured the mixing-chamber B. A part of the mixing-chamber extends upwards within the chamber or casing, thus forming between the walls of the chambers, a narrow annular space C, which is filled, or partly filled, with mercury or other suitable liquid. D is a gasholder of thin sheet-metal, having numerous perforations or slots, for a purpose hereafter explained. This holder is arranged to move freely up and down in the annular space containing the mercury. The mixing-chamber is provided with an inlet-pipe E for the admission of gas to be carburetted; and an outlet-pipe F for the flow of the carburetted gas to the burners. A vapourizing or hydrocarbon chamber G is firmly secured to the lower end of the mixing-chamber, and part of this vapourizing-chamber extends upwards within the mixing-chamber. This extension of the vapourizing-chamber is provided with a circular aperture for the passage of the hydrocarbon vapour into the mixing-chamber; the flow of vapour through this aperture being regulated properly. The vapourizing or hydrocarbon chamber G is connected by a pipe H with a reservoir or tank R (see fig. 3) for the supply of the liquid gasoline or other hydrocarbon. This tank may be at any convenient distance from the carburetter; but the top of it should be at such a level as to prevent the flow of hydrocarbon through the opening in the upper end of the hydrocarbon chamber G into the mixing-chamber B—that is to say, the top of the tank should be below the level of the opening. A stem or spindle J is attached at its upper end to the gasholder D, and is provided at its lower end with a grooved part or valve arranged to slide freely up and down in the aperture in the upper end of the vapourizing chamber. The valve is made with V-shaped grooves tapering from the lower end of the valve to, or nearly to, the upper end; so that, by raising or lowering the valve in the circular aperture, the passage for the flow of hydrocarbon vapour from the chamber G into the mixing-chamber B will be enlarged or reduced, and will be completely closed when the holes are below the level of the mercury—that is to say, when the holder D is at the lower end of its movement. A casing or jacket K is fitted on the lower end of the mixing chamber, and surrounds the vapourizing-chamber G; a suitable space being left between the chamber and the casing to form a heating chamber. A ring or annular piece L, having in one portion or segment thereof a number of perforations, is firmly secured between the chamber G and

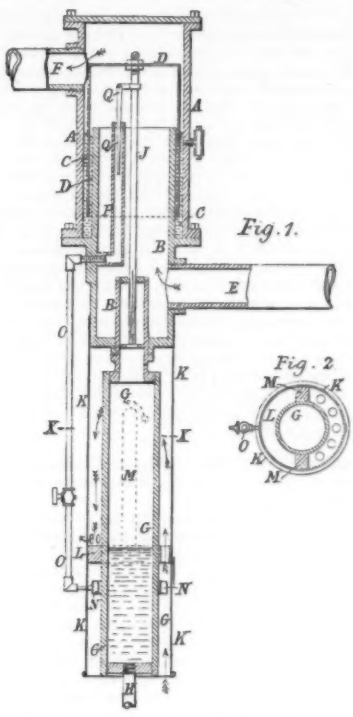


Fig. 1.

Fig. 2

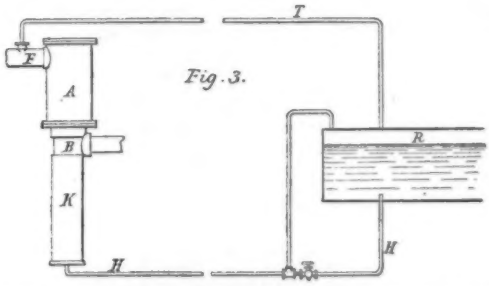


Fig. 3.

the casing K. Vertical partitions M are, moreover, arranged between the chamber G and the casing K, and extend from the annular piece L to near the top of the vapourizing-chamber, so as to divide the heating chamber into two parts communicating with each other at their upper end. A burner N is arranged within the casing or jacket K and surrounds the chamber G below the ring or annular piece L. The lower end of this casing is left open for the admission of air to support the combustion of the gas issuing from the burner; and holes for the escape of the products of combustion from the burner are formed in the casing at the lower end of the heating-chamber, and on the opposite side of the partition to that on which lie the holes.

By this construction of apparatus it is possible to prevent the passage of currents of cold air through the flues after the supply to the burner been cut off—that is to say, there will then be in the flues columns of heated air of equal height; and these columns will counterbalance each other, and, there being no aperture for the escape of the heated air at the upper end of the flues, there will be practically no flow of air through the flues except when heat is applied to the air in one of them.

The burner N is supplied with gas from the mixing chamber B through a pipe O connected with another pipe P which extends upward within the mixing-chamber B. To provide for the automatic control of the supply of gas to this burner, so that the flame will be enlarged or diminished according to the quantity of carburetted gas being consumed, a taper rod or valve Q is attached to the spindle J and is arranged to slide freely up and down in the upper end of the pipe P for the supply of gas to the burner, so that the valve will be operated by the holder D.

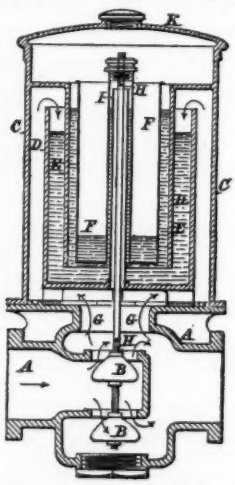
The tank R for containing the liquid hydrocarbon is, as already stated, connected by the pipe H with the vapourizing chamber G. The pipe is provided with a valve for shutting off communication between the tank and the vapourizing-chamber; and it is, moreover, connected by another pipe S with the top of the supply-tank R so that, should heat be applied to the vapourizing-chamber while the valve T is closed, the liquid hydrocarbon may flow from the chamber through the pipe S into the tank R, thus preventing the raising of the pressure in the vapourizing-chamber above that due to the head of liquid in the tank or in the pipe S. The hydrocarbon in the tank should either be exposed to the atmospheric pressure, or the tank should be closed and connected by a pipe T to the supply-pipe F for the carburetted gas. Then, as gasoline flows out of the tank, gas will enter, and *vice versa*; thus ensuring an approximate balance of pressure throughout the apparatus.

The operation of the apparatus is as follows:—The vapourizing-chamber G after being filled, or partly filled, with the liquid hydrocarbon, is heated by means of the burner N. The flame or products of combustion in ascending impinge against the annular piece L, and pass through the holes therein into the heating-chamber on one side of the chamber G and partitions M. They then ascend and pass over the partitions M and descend on the other side of them and the chamber G,

and finally pass out of the casing K through the holes provided for the purpose. The heat evaporates the gasoline, and the pressure thus generated forces the liquid gasoline downward in the chamber G and causes some of it to flow back into the tank. When the pressure above the gasholder Dis diminished by the consumption of carburetted gas, the pressure of the gas entering through the inlet E raises the holder until a greater or less number of its holes are above the surface of the mercury in the space C, so that the carburetted gas may pass from the mixing-chamber B through the holes. The greater the number ef holes above the surface of the mercury, the greater will be the quantity of carburetted gas allowed to pass to the burners. As the gasholder rises and opens holes for the passage of the carburetted gas, it also raises the spindle J and thus correspondingly opens the passage for the flow of the hydrocarbon vapour from the chamber G into the mixing-chamber B, and opens the passage for the carburetted gas from the mixing-chamber to the burner N through the pipes P and O. When the burners for consuming the carburetted gas are closed, and there is consequently no flow of gas through the apparatus, the holder descends until all the holes are below the surface of the mercury. The cylindrical portion of the spindle J then closes the aperture at the upper end of the hydrocarbon chamber G and thus shuts off the supply of hydrocarbon vapour to the mixing chamber B; and the valve Q nearly closes the supply to the burner. In this way only sufficient gas can pass through the pipe P to keep the flame of the burner alight.

REGULATING THE SUPPLY OF GAS TO MAINS, PIPES, LAMPS, BURNERS, AND OTHER APPARATUS.—Gordon, W., of Seacombe, Cheshire. No. 2908; Feb. 19, 1889. [8d.]

This invention relates to a controlling device in which the pressure of the passing gas is employed and acts in such a manner as to regulate the volume admitted to it. The gas enters by a valve or valves controlled by a spindle on, or in connection with which a float is employed. This float is arranged in a chamber containing glycerine, mercury, or other suitable liquid; and outside or near it is another vessel containing fluid —the chambers communicating with each other. The chamber last specified is in communication with the surface of the gas passage or chamber on the outlet or low-pressure side of the apparatus; and thus the pressure of the low-pressure gas acts upon the surface of the liquid in both chambers to rise and fall respectively, or to stand at certain heights. Then, as the liquid falls or rises in the float chamber, so the float rises and falls; and by its movement the valve controlling the gas-inlet is moved and opens or closes the gas-inlet passage.



A is the governing-valve, case in which work ordinary valves B. C is the outer case within which the float and liquid are located. D is the wall of the vessel within which the liquid is contained; and E is a curtain dropping down into the liquid in D, closed at the top. Connected to the outer casing F is the float, which rises and falls in the liquid contained in the vessel D. G is a passage communicating between the exit or low-pressure side of the valve case A and the space between the walls D. H is the valve spindle, which is connected to the upper part of a tube fixed in, and springing from, the bottom of the float; and I is a tube fixed in the bottom of the vessel and arranged within the tube.

The float and the gas are isolated by the liquid in the vessel D and the curtain E; and the gas in the low-pressure or exit side of the valve has access to, and is free to act upon, the surface of the liquid between the curtain and the wall D—connection between the two being by way of the passage H and the space between the walls D and the case C. These passages are made of large capacity, in order to cause the fluctuations of pressure occurring in the low-pressure side of the valve to be transmitted, practically instantaneously, to the liquid, and so to the float supported thereby. By these means the fluctuations of gas pressure are caused to act instantly upon the liquid and the float, and so to the valves B; and they consequently cause the apertures controlled by the valves to be more or less filled thereby. Thus, the patentee remarks, the governing of the flow of gas is rendered very sensitive, which is of the greatest importance where governing or regulating appliances are used in connection with the supply of gas to burners enclosed by glass chimneys or the like.

APPLICATIONS FOR LETTERS PATENT.

19,763.—MORRIS, F., "An improved apparatus for charging inclined gas-retorts." Dec. 9.

19,780.—HEALD, A., "Improvements in gas regulators." Dec. 9.

19,851.—COX, H., jun., "A further improvement in connection with his previous invention (No. 1634, Feb. 3, 1888) of an improved atmospheric gas-regulating tap." Dec. 10.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE DINSMORE PROCESS.

SIR,—It is to be regretted that Mr. Carr in his letter has adopted such a tone as will render it impossible for me to continue any further discussion of this subject.

It is generally supposed when a paper is read before any technical society that criticism is desired, and is welcomed by the author. If the statements in the paper are upheld, so much the better for the process or whatever it may be that has been described; if they are shown to be faulty, then at least some truth may be arrived at.

Had I remained silent after the remarks in your short leader, my silence could not have been but misunderstood.

My queries and Mr. Carr's retorts are before your readers; but he has failed to make any satisfactory reply to my figures.

Ramsgate, Dec. 18, 1889. WILLIAM A. VALON.

SIR,—Mr. Isaac Carr, of Widnes, in his paper on the above process, referring to his mixture of coal, nuts, and slack, states: "The gas-producing power of the above is as follows:—In ordinary retorts about 9300 cubic feet of 16¼-candle gas. By carbonizing one-third of it in the Dinsmore beds, 10,300 cubic feet of 20½-candle gas is obtained; making the total production in the whole of the works 9600 cubic feet of 19-candle gas." Mr. Valon, in the JOURNAL for the 10th inst., shows that the above statements "cannot be reconciled with what have hitherto been considered reliable data." With Mr. Valon, I agree. But, if Mr. Carr's statements are examined, it will be found that what he states in words does not agree with his statement in figures. One-third of 11,653 tons is not 3621, but 3884 tons, which producing 37,300,000 cubic feet = 9603 feet per ton of 20·5 candle gas, not 10,300 feet as stated. Two-thirds of 11,653 tons is not 8032, but 7768 tons, which producing 74,700,000 cubic feet of gas = 9616 feet per ton of 16·5-candle gas, not 9300 feet as stated.

Now, will one-third of 9603 feet, which is 3201 feet of 20·5-candle gas, and two-thirds of 9616 feet, which is 6410 feet of 16·5-candle gas, produce 9611 feet of 19-candle gas? No; they will produce 9611 feet of 17·8-candle gas.

$$(3201 \times 20{\cdot}5) + (6410 \times 16{\cdot}5) \div 9611 = 17{\cdot}8.$$

The Dinsmore gas must, therefore, be of a higher quality—as shown by Mr. Valon. According to the above calculation, it must be 24 candles.

$$(3201 \times 24) + (6410 \times 16{\cdot}5) \div 9611 = 19.$$

Mr. Carr states that from the Dinsmore process there is an increase of quantity; but his figures when worked out show only an increase of quality. I—and, no doubt, Mr. Valon—will admit that the increase of quality can be obtained from the weight of tar used to produce it, even when the weights of the products are compared with the weight of the tar. The difference between the weights of the gases—9603 feet of 24 candles, Dinsmore gas, and 9616 feet of 16·5 candles' ordinary gas—is only 75·772 lbs., not 111·767 lbs., as calculated, on 10,300 feet by Mr. Valon for not only extra quality, but also extra quantity as stated by Mr. Carr.

In your JOURNAL for the 10th inst., you report that Mr. Pritchard and Mr. Meiklejohn—both of whom had tried the Dinsmore process—could speak only of extra *quality* as the result. The experience of each is certainly only a very limited one; so also is Mr. Carr's. His statement of the balance-sheet appears to me premature, and therefore unreliable. Has he not been urged and hurried on to make it? Yet, with his limited experience, he has certainly done his best.

According to the return for the year ended March 25, 1888, the make of gas for that year, at Widnes, was 99,174,000 cubic feet, produced from 9309 tons of coal. Now, as 9309 tons and 99,174,000 feet are nearly proportional to 10,566 tons and 120,000,000 feet inserted in the Dinsmore balance-sheet, and as the third and fourth numbers are what we may expect to find in Mr. Carr's next year's financial return of the Widnes Gas-Works, we shall at the end of this year see whether Mr. Carr increases his ordinary balance by 4·1d. per 1000 cubic feet of gas sold.

Even then Mr. Carr's experience will be too limited to satisfy enquirers as to the durability of the duct—half of which is exposed to a high heat, while the other half is exposed to a low heat. Will it last as long as the ordinary retorts surrounding it? If not, how often will it need to be renewed? To decide these questions, an experience of three years is required.

Nothing is stated by Mr. Carr as to the cost of the water used for cooling the outlet of the duct. All of it, without extra pumping, is probably utilized on the works. If not, the cost ought to be inserted, and the water charged, at the selling price—although both the water and gas works are under the management of the Widnes Local Board.

I and my Directors are frequently being solicited by either Directors, shareholders, or agents of the Dinsmore Company to adopt their patents. But I hope to persuade my Directors to wait until some financial gain is shown—especially as I, myself, was an eye-witness of the demolition of Dr. Eveleigh's patent plant, by my brother, the Engineer of the Barnet Gas-Works. For the benefit of the shareholders (some of whom are personal friends of mine), I wish the Dinsmore Company may succeed in proving the financial value in the adopting at gas-works of their patent process of gas making.

Ormskirk, Dec. 16, 1889. JOHN MARTIN.

THE STOKERS' STRIKE.

SIR,—The shareholders of the South Metropolitan Gas Company are fortunate in having such a Chairman and Board of Directors as they have, at this critical period of the Company's existence. Labour has entered into a conflict with capital, and capital has beaten. The strikers have been struck. This time, it is the tyranny of labour (reckless of consequences to the innocent public) which has been "kicking against the pricks;" and the kickers—the poor deluded men—find themselves now with a "Thorne" in the flesh, and surrounded by wailing wives and starving children, with winter before them.

If ever there was a case where capital performed its duty, both to the

men and to the public, it has been exemplified by the South Metropolitan Gas Company. The men had their bread well buttered on one side; and because the Chairman and Directors voluntarily proposed to add a little on the other side, and to lay it on in their own way, they reject the offer! Like the Prodigal Son, they will no doubt soon repent; but with this difference, that repentance will come too late, and the door will be shut against them. It is not as if there were any great principle at stake; nor was it an attempt on the part of the Directors to reduce the men's wages. On the contrary, it was a bonus offered to them as an inducement to thrift; but they insisted on "looking the gift horse in the mouth," and they have now to bemoan the fate of him who "was well, wanted to be better, took physic and died."

No one denies the right of the men to combine for the purpose of increasing the value of the article they deal in—their labour; and they have the most perfect right to work or not to work at the wages offered them. But it is not right that this combination should be used to prevent other men, who are able and willing to work, from exercising their individual freedom, and to be nicknamed "blacklegs," and maltreated because they prefer to dispose of their labour in their own way. It is the duty of the Government to see that the existing law with regard to intimidation and freedom of contract is scrupulously obeyed. Free trade is meant to leave traders free (whether they have merchandise or labour to sell) to dispose of it in the dearest market; and those who require to buy one or the other, to obtain it in the cheapest market they can find. The good man and the bad man alike should be paid what their labour is worth, and leave supply and demand to settle its value.

Not only should the shareholders thank the Chairman and Directors of the South Metropolitan Gas Company for their bold and unflinching method of dealing with the strike, but the public should thank them too for battling with this communistic tyranny, which, regardless of consequences, threatened to deprive all those within the range of the Company's mains of one of the necessaries of life.

The result of the strike will be that the "Mother of Invention" will step in, and introduce mechanical stoking and gravity retort-settings, and all gas-works of magnitude will be compelled to have a water-gas plant as an auxiliary, so that in times of emergency they can fall back upon their coke heaps and tar tanks, to help them out of their difficulties. A poisonous gas which will give a light, will be better than darkness; as there would be far more deaths from accidents through the absence of light, than by the presence of an excess of carbonic oxide in the gas they would deliver.

GEO. BOWER.

St. Neots, Dec. 14, 1889.

IS WATER GAS POSSIBLE IN BRITISH GAS-WORKS?

SIR,—Will you allow me a few words in reply to Mr. Bell's letter in your issue of the 10th inst.?

First, let me say that the question under discussion here can hardly be solved by sneering at "water gas patentees," or by sarcastic references to "disinterested parties." I am not, and do not claim to be, a "disinterested party." I am, contrariwise, deeply interested not only in the subject of water gas generally, but in the success of my special method of making it. As Mr. Bell seems to be warmly interested—for some reason or other—in depreciating illuminating water gas as a commercial factor in England, there is apparently but little to choose between us on the score of "interest."

I do not ask Mr. Bell to adopt any "fine-spun fancies" of mine; nor do I wish to paint any "roseate pictures" for him or others. When he comes to Humphreys Hall, I shall only ask him to believe what he sees with his own eyes, and what he hears from undisputed authority. When he then sees—as I know from experience he will—beautiful, pure, illuminating water gas—"not smoky (sic)"—tested to 22 candles, made in "an ordinary small generator with fixing chamber above," I am confident that he will be candid enough to acknowledge that such evidence is conclusive. When, in addition, he is shown carefully verified figures on the question of cost, I am equally sure that he will admit that sound progress has been made towards the solution of the vexed problem of "illuminating water gas in British gas-works."

I am sorry to see that a gentleman of Mr. Bell's ability should re-echo the "cuckoo cry" of the unlearned about "almost inodorous but poisonous water gas." Carburetted hydrogen, which is illuminating water gas, has a powerful, pungent, and characteristic odour, quite as strong and perceptible as the smell of ordinary coal gas. Its escape can be instantaneously detected by any ordinary nose. As to the poisonous character of water gas, a great deal of nonsence has been said and written; and one would really fancy, from reading some of the literary productions which have been inflicted upon the public in this connection, that coal gas was the most innocuous thing in the world, and water gas the most dangerous. The real truth is that any gas which contains carbonic oxide in greater or less proportions is poisonous. Coal gas contains this poisonous property, so does water gas; and while it is true that the proportion of carbonic oxide in water gas is somewhat in excess of that contained in coal gas, it is also unquestionable that coal gas contains enough of this dangerous product to render its inhalation fatal to human life. The most ordinary precautions taken by persons in their sober senses will prevent asphyxiation by water gas, quite as well as by coal gas; and it is, to my view, rather unfair to stamp water gas as "poisonous," while keeping in the background the fact that coal gas is also "poisonous" in the hands of a drunkard or a fool. With such classes we are not supposed to deal. Those who manage water-gas systems, and those who manage coal-gas systems, deal with the ordinary common-sense public, in an ordinary common-sense way, and not in the least supposing that the merits of their systems are to be judged by the vagaries of idiots, or the irresponsible freaks of sots. As an "illustration" of the manner in which coal gas sometimes acts upon human beings, let me refer to the recent disaster at Birmingham. [Our correspondent here quotes from *The Times* the account of this accident, which was referred to last week, p. 1169.]

There should be no appeals made in this matter to passion or prejudice. No amount of personal insinuation, slighting depreciation, or sneering criticism will for a moment divert the public mind from the crucial issue: "Shall we have better gas at the same price, or must we adopt electricity?"

B. VAN STEENBERGH.

London, Dec. 16, 1889.

Parliamentary Intelligence.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE (SESSION 1890) UNDER THE GAS AND WATER WORKS FACILITIES ACT, 1870.

ALDERSHOT GAS AND WATER.—The Aldershot Gas and Water Company seek authority to raise further capital, purchase lands, and erect additional works. They wish to have the principle of the sliding scale applied to the price of gas and to the dividends; and also to be empowered to supply gas and water in bulk.

ALTON (HANTS) GAS.—The Alton (Hants) Gas Company apply for power to maintain and continue their existing works, and to manufacture and supply gas in the parish of Alton. To enable future extensions of the works to be carried out, additional land is needed. Authority is sought to raise further capital, acquire patent rights, sell gas in bulk, and supply gas stoves, fittings, &c.

BARNOLDSWICK GAS.—The Barnoldswick Gas Company, Limited, desire authority to maintain and continue their existing, and to construct additional works and increase their capital. Other general powers will be applied for.

CAMBORNE WATER.—The Camborne Water Company seek power to raise more capital, and to acquire land for the extension of their works by the construction of two additional reservoirs at Cargenwyn, in the parish of Crowan, in Cornwall, with the necessary auxiliary works to connect the new reservoirs with the existing Cargenwyn reservoir.

CATON WATER.—Application is to be made by certain persons (who are not named in the notice) for authority to construct water-works in the township of Caton, in Lancashire, supply water therein and in the township of Quernmore, and levy rates and charges. The usual powers granted to water undertakings will be asked for.

FRITH HILL, GODALMING, AND FARNCOMBE WATER.—The Frith Hill, Godalming, and Farncombe Water Company wish for power to construct additional works, extend their limits of supply, and amend their Orders of 1876 and 1886.

HOLLINGWORTH GAS.—The Hollingworth Gas Company intend to apply for powers to maintain and continue their existing works and supply gas in the township of Hollingworth, and also to extend their premises. Authority to purchase additional land is sought, as well as powers to break up streets, sell gas in bulk, supply meters and fittings, acquire patent rights, and raise more capital.

HOYLAKE AND WEST KIRBY GAS AND WATER.—The Hoylake and West Kirby Gas and Water Company, Limited, will apply for power to raise additional capital for the purposes of their undertaking; also for authority to deal in gas stoves, fittings, and appliances, and hold patent rights and licences in relation to the production of gas or other artificial light.

HUNTINGDON AND GODMANCHESTER GAS.—The Huntingdon and Godmanchester Gas Company require power to maintain their existing works, and carry on the manufacture, supply, and storeage of gas and residual products. They wish to have their present capital regulated and increased, and their limits defined; and they also seek for authority to acquire additional lands, and patent rights for the manufacture or distribution of gas, the utilization of residuals, or the production of any means of artificial light.

LEATHERHEAD AND DISTRICT WATER.—The Leatherhead and District Water Company are about to apply for authority to raise additional share and loan capital.

LLANDRINDOD GAS.—Authority is sought by certain persons to erect and maintain gas-works, and generally carry on the business of suppliers of gas, in Llandrindod Wells, Cefnllys, and Trefonen, in the county of Radnor.

MID-KENT WATER.—The Mid-Kent Water Company wish to be empowered to construct new works; extend their limits of supply so as to include Aylesford, East Malling, Cuxton, and other places; and increase their capital.

SHEFFIELD GAS.—The Sheffield Gas Company are desirous of using certain land now in their possession for the purpose of erecting additional works for the manufacture of gas, and they seek the necessary authority; also power to alter section 93 of their Act of 1855 with respect to special contracts with consumers, and likewise to provide for the establishment and management of a superannuation fund or funds for officers and servants, to be contributed to, if thought fit, from the revenues of the Company.

STOCKPORT WATER.—The Stockport District Water-Works Company seek power to raise additional capital for the purposes of their undertaking; and to amend and extend the provisions of the two Acts and the Provisional Order under which their operations are now carried on.

STOURBRIDGE GAS.—The Stourbridge Gas Company require authority to use a plot of land in the parish of Oldswinford for the erection of gas-works, and to adopt a sliding scale of price and dividend. They also wish to have confirmed an arrangement come to between them and the Brierley Hill District Gas Company for defining the limits of supply of the two undertakings.

STUDELEY GAS.—The Studeley Gas Company, Limited, seek authority to maintain and continue their existing works, and supply gas in the parishes of Studeley and Samborne, in Warwickshire; to sell gas in bulk; deal in stoves and other appliances; and generally carry on their business with the usual powers.

TODMORDEN WATER.—The Todmorden Water Company seek power to raise additional capital for the purposes of their undertaking.

USK WATER.—The Usk Water-Works Company, Limited, propose applying for power to construct water-works in the parishes of Goytre, Gwehelog, Monkswood, Llanbaddoc, and Usk, in the county of Monmouth, and to supply water in those places. The necessary authority for breaking up roads, laying mains and pipes, and levying rates and charges, will also be sought.

WARE GAS.—The Ware Gas Company, Limited, require power to maintain and enlarge their existing works, and to purchase additional land for the purpose. They wish to have their present capital defined, and to obtain authority to increase it. The usual powers as to the manufacture and sale of gas and residual products, the supply of gas in bulk, the levying of rates and charges, the manufacture and sale of stoves and fittings, the breaking up of streets, and the acquisition and use of patent rights, are to be included.

WELLINGBOROUGH GAS.—The Wellingborough Gas Company desire authority to extend their limits of supply so as to include the parishes of Wilby, Great Doddington, and Earls Barton, in Northampton, with the necessary powers as to opening roads, &c., in these places. Special rates are proposed for the district to be added. The Company also wish to undertake the supply of stoves and fittings.

YORK TOWN AND BLACKWATER GAS.—The York Town and Blackwater Gas and Coke Company, Limited, wish for power to maintain and continue their works, and to manufacture and supply gas in the parish

of Frimley, in Surrey, and in part of the parishes of Hawley and Yateley in Southampton. Further capital is needed; and the necessary power to raise it and carry on the undertaking will be applied for.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE UNDER THE ELECTRIC LIGHTING ACTS 1882 AND 1888.

Notices have been given of intended applications to the Board of Trade, in the ensuing session of Parliament, for powers in regard to the supply of electricity for lighting and other purposes in the under-mentioned places; the applicants being the Local Authorities only, except where otherwise stated:—

Aberdare—Western House-to-House Company. Aberdeen—Corporation*; Scottish House-to-House Company. Accrington. Airdrie Burgh. Ashton-under-Lyne—Municipal Electric Light and Power Corporation. Ayr Burgh.

Bacup. Barnsley—Corporation; National Electric Supply Company. Barrow-in-Furness—Lancashire and Cheshire House-to-House Company. Bedford—Corporation; Midland House-to-House Company. Belfast.* Birkenhead.* Birmingham—Birmingham House-to-House Company. Blackburn.* Blackpool.* Bognor—Electric Trust. Bolton.—Lancashire and Cheshire House-to-House Company. Bootle-cum-Linacre—Lancashire and Cheshire House-to-House Company. Bournemouth—Brush Company; South of England House-to-House Company. Brighton and Hove—Brighton and Hove Electric Light Company. Bristol—Brush Company; Western House-to-House Company. Burnley. Burton-upon-Trent.* Bury—Corporation*; Cheshire House-to-House Company.

Cambridge. Cardiff—Brush Company; Electric Trust; Western House-to-House Company. Carlisle—Brush Company. Chadderton. Chatham and Strood—Chatham, Rochester, and District Electric Lighting Company. Cheltenham—Corporation; Brush Company; Laing, Wharton, and Down Syndicate; Midland House-to-House Company. Chester. Coatbridge—Scottish House-to-House Company. Cork—Irish House-to-House Company. Coventry—Midland House-to-House Company; Crompton. Croydon—Croydon Electric Supply Company; South of England House-to-House Company. Crystal Palace and District—Electric Construction and Maintenance Company.

Darlington—Corporation*; Northern House-to-House Company. Derby. Dewsbury—National Electric Supply Company. Dover. Dundee—Corporation Gas Commissioners*; Brush Company; Scottish House-to-House Company.

Eastbourne—Eastbourne Electric Light Company. Edinburgh—Scottish Electric Supply Company. Edinburgh and Leith—Scottish House-to-House Company.

Fleetwood. Folkestone—Messrs. Crompton and Co., Limited.

Galway—Galway Electric Company. Glasgow—Corporation*; Brush Company; Messrs. Muir, Mavor, and Coulson, Limited; Scottish House-to-House Company.

Hanley—Birmingham House-to-House Company. Hamilton Burgh.* Harrogate—National Electric Supply Company. Hastings—Corporation; Hastings and St. Leonards Electric Light Company. Hawick—Scottish House-to-House Company. Huddersfield. Hull—Corporation; National Electric Supply Company.

Ipswich—Brush Company.

Kelvinside—Kelvinside Electricity Company. Kingston-upon-Thames and District—Kingston Corporation; South of England House-to-House Company.

Lancaster.* Leeds—Electric Construction and Maintenance Company; National Electric Supply Company; Yorkshire House-to-House Company. Leicester—Corporation*; Midland House-to-House Company. Liverpool—Liverpool House-to-House Company. London—Brush Company; Chelsea Electricity Supply Company; Electricity Supply Corporation; Gatti, A. and S.; House-to-House Electric Light Supply Company; Kensington and Knightsbridge Electric Lighting Company; Laing, Wharton, and Down Construction Syndicate; London Electric Supply Corporation; Maxim-Weston Electric Company; Metropolitan Electric Supply Company; Renshaw, King, and Co.; St. James's and Pall Mall Electric Light Company; Westminster Electrical Syndicate; Westminster Electric Supply Corporation. Londonderry—Irish House-to-House Company.

Malvern and Leigh—Midland House-to-House Company. Malvern Link and District. Manchester—Corporation*; Brush Company; Laing, Wharton, and Down Syndicate. Manchester, Salford, and District—Manchester House-to-House Company. Margate and Westgate—Municipal Electric Light and Power Corporation. Morecambe—Messrs. T. R. Andrews and T. Preece.

Newcastle-upon-Tyne—Northern House-to-House Company. Newport (Mon.)—Electric Trust; Western House-to-House Company. Northampton—Electric Light and Power Company. Norwich—Brush Company. Nottingham—Corporation*; Midland House-to-House Company.

Oldham—Corporation*; Lancashire and Cheshire House-to-House Company. Oxford—Electric Construction and Maintenance Company; Midland House-to-House Company.

Paisley.* Partick, Hillhead, and Maryhill—Gas Company. Plymouth District—Devon and Cornwall Electricity Supply Company; Electric Trust. Portsmouth—Corporation; Laing, Wharton, and Down Syndicate; Portsmouth and South Hants Electricity Supply Company. Preston—National Electric Supply Company. Preston and Fulwood—Lancashire and Cheshire House-to-House Company.

Ramsgate and Broadstairs—Municipal Electric Light and Power Corporation. Reading—Brush Company; South of England House-to-House Company. Richmond (Surrey) District—Brush Company; Messrs. Latimer Clark, Muirhead, and Company; South of England House-to-House Company. Rochdale—Lancashire and Cheshire House-to-House Company.

Salford.* Scarborough—Brush Company; Electric Construction and Maintenance Company; Yorkshire House-to-House Company. Sevenoaks—Electric Trust. Southampton—South of England House-to-House Company. Stafford.* St. Helens.* Stockport—Brush Company. Stockton-on-Tees.* Sunderland and District—Electricity Supply Company.

Tiverton. Torquay and District—Devon and Cornwall Company; Municipal Electric Light and Power Corporation. Tunbridge Wells—South of England House-to-House Company. Tunstall—Electric Trust.

Walsall.* Wednesbury. West Bromwich.* Wigan. Windsor and Eton—Windsor and Eton Electric Light Company. Woking—Woking Electric Supply Company. Wolverhampton. Worcester—Corporation; Midland House-to-House Company. Wrexham—Wrexham and District Electric Supply Company. Yarmouth (Great). York—Corporation; National Electric Supply Company. Yorkshire House-to-House Company.

* The asterisk (*) indicates that the gas supply is in the hands of the Local Authority applying.

NOTICE OF AN APPLICATION TO THE LOCAL GOVERNMENT BOARD UNDER THE PUBLIC HEALTH ACT, 1875.

Burley-in-Wharfedale Local Board.—The Burley-in-Wharfedale Local Board are desirous of purchasing the portion of the undertaking of the Burley Gas Company, Limited, lying within their district; and they have given notice of the intention to apply to the Local Government Board for the necessary authority. In addition to power to purchase this plant, they will ask for authority to acquire lands (not, however, for the manufacture or storeage of gas), to supply gas in bulk, to deal in stoves, fittings, and other appliances, to levy rates and charges, and to borrow money for the purposes of the undertaking.

Hexham Local Board and the Gas Company.—The Local Board of Hexham appear to be a very unreasonable body. They have decided to light the outskirts of the town, and, for this purpose, require the Gas Company to lay 1355 yards of mains, over which they propose to distribute only seven lamps, instead of, as usual, one for every 50 yards, which would make the number 27. As commercial men, the Directors of the Company cannot accede to the Board's demands; but they have expressed their wish to meet them in a broad and liberal spirit, both as to the number of the lamps and the price of gas; and they have suggested that the lighting of the town, the question of new mains, and the price of gas should be put to arbitration for the public good. At the meeting of the Board yesterday week, it was resolved to refer the matter to the Gas Committee.

The Quality of the Gas at Bristol.—At a meeting of the Bristol Sanitary Authority last Thursday, Mr. B. Kitt, the Gas Examiner, reported that, on the 7th and 9th inst., he found the illuminating power of the gas to be 13·40 and 13·38 candle power; being 0·10 and 0·12 below the standard. Experiments were made at irregular intervals. Since then, up to the 13th inst., the quality of the gas improved to 13·50 and 14 candle power. Formerly the quality reached 16 candles. The decrease of the lighting power to 13·50 candles was the chief cause of the many complaints. The Company were not obliged to give more than a quality equal to 13·50 candles. The average for the last fortnight had been 14·04 candles. The members thought there was good cause for the many complaints which had been made; and they decided to appoint a Committee to consider the matter.

The Birkenhead Corporation and their Trading Powers.—A meeting of owners and ratepayers of Birkenhead was recently held to sanction or otherwise the promotion of the Bill of which the Corporation have given notice, as stated in the Journal last week. The Mayor (Mr. C. J. Gostenhofer) presided, and moved a resolution formally approving of the Bill; and the motion was seconded. Whereupon a ratepayer inquired as to the "other powers" which were sought in the last clause of the Bill. The Town Clerk explained that the Gas Committee wished to be allowed to let out gas stoves, fittings, engines, &c., on hire. It was then objected that this would enable the Corporation to become a trading concern, and to compete with tradesmen in the town. This was regarded with much apprehension. After some discussion, the opinion of the meeting was taken on the question; and, in the event, sanction was given to the Bill, on the understanding that the clause objected to should be withdrawn.

Convictions for Wasting Water.—Two summonses, taken out by the Kent Water Company, against consumers for wilfully wasting water by connecting the outlet-valve of the cistern to a nail in the wall, and thus allowing an unchecked discharge, were heard at Greenwich Police Court last Tuesday. Mr. Dickson, the Secretary, represented the Company. The first case was that of Mrs. M. Hopkins, of 119, Church Street, Deptford, who pleaded guilty, and explained that what she done was necessary in self-defence, as otherwise the premises would have been flooded, in consequence of the defective state of the fittings. An inspector proved the offence, and denied that the action of the defendant was needed, as the fittings were in good order. As the supply was constant, the waste would be about 150 gallons an hour. The Magistrate said the Company must be protected against such a serious loss of their water; and he fined defendant 40s., and 2s. costs. The other case was that of Mr. W. H. Hawker, of 138, Church Street, Deptford. It was explained that this was somewhat different to the other offence, inasmuch as the defendant had found the fittings defective on taking the house, and had merely continued to use the contrivance of his predecessor. Mr. Dickson suggested that his Worship might perhaps take a lenient view of this case. The defendant had been to him and expressed his regret. The Magistrate cautioned the defendant against repeating such a practice; and, under the circumstances, fined him 1s., and 2s. costs. Mr. Dickson remarked that the Company did not come to the Court for the sake of the penalties in these cases, but solely to stop the practice of fastening valves open, which must necessarily greatly interfere with the proper supply of water in the district.

The Suggested Amalgamation of Manchester and Salford.—A further statement of facts bearing upon this question has been prepared and published by Mr. Edwin Guthrie, the Consulting Accountant to the Association which was formed for the purpose of promoting the union of the city and borough. In respect to water supply, he states that the occupiers of dwelling-houses in Broughton and Pendleton pay 2d. in the pound more for water than the like occupiers in the city. But works, and other premises supplied by meter in those districts, have an advantage of 3d. in the pound in respect of the public water-rate. The Salford district not being supplied by Manchester direct, but through the Salford Corporation, has an advantage of about 1d. in the pound. Concerning the gas supply, at the date dealt with by the original report (1886-7), the prices of gas in the city and borough were as follows:—Manchester, 2s. 8d. per 1000 cubic feet. Salford, small consumers, 3s. 1d. per 1000 feet; and consumers of above 250,000 cubic feet per quarter, 3s. per 1000 feet. Average difference in favour of Manchester, 4½d.—equal to an augmentation of the Salford rates of about 3¾d. in the pound. The charges remained the same for 1887-8; but in the year 1888-9 they were: Manchester, 2s. 8d. per 1000 feet. Salford, small consumers, 2s. 10d. per 1000 cubic feet; large consumers, 2s. 9d. per 1000 feet. Average difference in favour of Manchester, 1¼d.—equal to an augmentation of the Salford rates of about 1½d. in the pound. At the present time the prices are: Manchester, 2s. 6d. per 1000 feet. Salford, small consumers, 2s. 6d. per 1000 feet; large consumers, 2s. 5d. per 1000 feet. An average difference in favour of Salford of ¼d. The Salford Gas-Works stand in the accounts (1886-7) as 21 per cent. more costly than the Manchester Gas-Works, in proportion to their producing capacity. Out of the higher rates and gas and water charges made by Salford, nothing has been saved. Out of her lower rates and gas and water charges, Manchester has saved about £2,500,000.

Miscellaneous News.

GAS WORKMEN AND THE LABOUR QUESTION.

The South Metropolitan Gas Company and Their Difficulties.

In the Journal last week we recorded, at some length, the progress of the important phase of the gas workmen's labour movement which had been witnessed in the Metropolis in the preceding ten days, and had culminated in the turning out of about 1800 stokers and other workmen in the employment of the South Metropolitan Gas Company. It will be remembered that, in sympathy with the movement, the Coal Porters' Union had threatened to stop the Company's supplies of coal if the demands of the Gas Workers' Union were not complied with; and as the Directors were unable to concede them, and had, moreover, made ample provision for the work relinquished by the disaffected men being carried on by other hands, the putting of this threat into execution was regarded as the only hope left to the Executive of the above-named bodies. As already reported, the first evidence of the interference of the coal porters in the affair was manifest at Rotherhithe last Saturday week, when a rumour was current that the coal whippers had refused to unload a vessel which had come up to the jetty that morning. The truth of the matter was that the collier, owing to the tide, could not be berthed in proper position under the steam-cranes; and consequently the work of unloading was unable to proceed. Some little anxiety was felt, however, as to what course the men would adopt on the following Monday morning. The men were not employed directly by the Company, but worked under a foreman contractor in their service—a system which only exists at Rotherhithe, and which it had, we believe, been arranged prior to the strike should cease at the close of the year. All the hands, however, who remained loyal to the Company during the strike would then be taken on as permanent hands, and share in the bonus-profit scheme. All doubt as to the course that would be taken by the men were set at rest on Sunday night, when the Superintendent of the Rotherhithe station (Mr. Browne) received an intimation from the foreman above referred to that his men had determined not to start work the next morning, and, as Unionists, had resolved to throw in their lot with the stokers. This decision had, of course, been anticipated by Mr. Browne, who had long been placed in a peculiar position with regard to the coal porters, in consequence of their not being actual servants of the Company. Two steamships were ready for unloading—one at the Company's own jetty at the riverside, and the other in one of the basins of the Surrey Commercial Docks, adjoining the works. Between 70 and 80 Union men would, in the ordinary course of things, have been set to work on these two ships; and the strikers asserted that the unloading would have occupied them about 14 hours—each vessel containing from 1200 to 1400 tons of coal. The most suitable of the new hands were promptly set to the work; and a gang of 50 men was sent in the course of Monday morning from the Old Kent Road works, under a police escort; their arrival at Rotherhithe causing immense excitement among the men on strike, who assembled at the gates and hissed and hooted them as they passed in. They were speedily set to work, and by the evening considerable progress had been made with the unloading of the coal; but the strikers expressed the utmost satisfaction with the slow rate at which this was being done. With regard to the work in the retort-houses, the new hands made very commendable headway in increasing the quantity of gas in store. But their difficulties were materially increased by trouble from choked ascension-pipes, attributable, there was every reason to suppose, to the condition in which they were left by the old hands. However, the progress made will be best shown by the following figures, giving the make in the four days named:—Dec. 12 (old hands at work), 23,000,000 cubic feet; Dec. 13, 13,500,000 cubic feet; Dec. 14, 14,750,000 cubic feet; Dec. 15, 16,750,000 cubic feet. The new men worked splendidly; and the few accidents which had occurred had not been very serious. With very few exceptions, the old hands, as well as the new, were still housed and provisioned on the works; but such of the men as preferred to go home to their wives and families were allowed 2s. 6d. per day in lieu of the food, &c. None of the latter were interfered with by the disaffected men.

Monday, the 16th, was a comparatively uneventful day; the only important fact to be recorded being that the make of gas was increased by about a million cubic feet, more aptitude being displayed by the new men in the performance of their duties. The action of the Union coal porters had, to a certain extent, "slowed" the delivery of coal; but the stock in hand had not seriously diminished, and no uneasiness was felt by the Company's Engineers on this score. Although the light in the public thoroughfares was not very brilliant at night, there was not much cause for complaint, all the circumstances of the case being considered; and it was generally thought that the worst of the inconvenience which was expected to result to the inhabitants and gas consumers of South London from this unhappy labour difficulty, had been successfully overcome.

On Tuesday, a renewed attempt was made to bring about a reconciliation of the two parties to the dispute. Messrs. Causton and Beaufoy, the local members of Parliament, had a long consultation with the Strike Committee, and at its conclusion they drove to the Company's offices, where they were engaged in conversation with Mr. G. Livesey until late in the afternoon. At the termination of the interview, the "mediators" (who were accompanied by the Rev. Mr. Chapman, Vicar of St. Luke's) went back to the Strike Committee's rooms to report the result; returning in a short time to the gas-works, when it was arranged that three of the old hands, who are Union men, should have a conversation with the Board on the following morning. In the course of the interview, Mr. Livesey expressed his willingness to meet any of the men who wished to see him; but he pointed out that he could not give the invitation, insomuch as this would only lead their own men to think that there was a possibility of wavering; and it was most important that the old hands should feel confident that neither they who stood by the Company nor the new men who had come to help them should have the slightest ground for thinking that the Company would desert them under any circumstances. The fact was, he said, there was little room for any of the old hands. The longer time they wasted, the less chance there would be for them, because the Company were taking on practised stokers every day. He added that the Company's position had been one that they could not help taking all through; and they could not get out of it. They must stand by the men who had been true to them. If they took back old hands, each would be taken on his merits; they would not be asked to sign an agreement. No man would be received to displace any man on the works; they could make room in this way: A number of the street men were working as stokers, their own work lying by. These would go back to their regular employment, and stokers would be taken on—each case being separately considered on its merits. As to the general position, the lighting all over the district had very much improved on Tuesday night, largely owing to the favourable weather. According to the reports received at the chief offices of the Company, matters were proceeding satisfactorily at all the stations, and the stock in hand at six a.m. had increased by 2 million cubic feet; the make during the previous 24 hours having been 17,750,000—a million cubic feet above the preceding day's record, and just a little less than 3 millions below the total usual average production. As the day was fairly bright and clear, and the temperature was high, the consumption was small; and at nightfall the progress of manufacture was so encouraging that an order was given to the lamplighters to light the street lamps at the ordinary time, instead of an hour later, as hitherto. The pressure also was increased. A procession of the strikers, headed by a band, and carrying the banners of the branches of the Union, started from the Central Strike Committee-Rooms, and made its way, *viâ* Deptford and Rotherhithe, to St. George's Church and Vauxhall, collecting money. In this way about £20 was obtained. On the return of the processionists to the Old Kent Road they cheered the strike leaders and hooted at the works; but although the gas workers on parade numbered about 1500, and the police were few, there was no disorder of any kind. A meeting was afterwards held. Picketing was resorted to again on Tuesday; but in a very half-hearted manner. In the course of the day a deputation of coal merchants waited upon the Lord Mayor and Sir John Lubbock, at the Mansion House, to complain that the coal porters had not carried out their compact of the preceding week. The matter arose under the following circumstances:—The Coal Porters' and the Amalgamated Seamen and Firemen's Union had entered into an agreement to the effect that no ship should be unloaded unless its crew were members of the last-named Union. Some seamen, members of a Sunderland Union, who were navigating certain of Lord Durham's colliers at Ratcliff, were called upon to join the London Union; and as they objected to do this, the unloading of their boats by the coal porters had been stopped. Mr. Michael Henry, the Secretary of the Coal Porters' Union, was present, and stated that the sailors in question were really working two vessels for the South Metropolitan Gas Company, and it was on their help that Mr. Livesey was relying. Sir. J. Lubbock pointed out that the men belonged to a Union of their own; and said there was no proof that the coal on board their ships was intended for the South Metropolitan Gas Company. One of the deputation said that, on the contrary, none of it would be supplied to them; it was all wanted for the merchants' own customers. Mr. Henry, while promising to do his best to put the matter right, threw the blame upon Mr. Livesey, for rejecting the proposals for a settlement of the dispute with his workmen. Later on the news reached London that the Sailors' and Firemen's Union at Shields had, in pursuance of orders received from the Executive Council, issued a notice that 24 hours' warning was to be given to all employers by members of the Union, unless they consented not to carry coals from the Tyne to the South Metropolitan Gas Company. In consequence of this notice, it was reported that several vessels had been stopped on the Tyne.

In accordance with the arrangement come to on the previous day, a deputation from the men had an interview last Wednesday with Mr. G. Livesey, Mr. F. Livesey, and several of the Directors of the Company. Among the latter was Mr. Robert Morton; and the delegates selected by the men were three of the Company's former servants—Mr. Mouan, a winter hand, a member of the Strike Committee; Mr. Marsh, a regular *employé*, an active supporter of the present movement, but not one of the Committee; and Mr. Cameron, also a permanent stoker of eleven years' standing. The conference lasted from shortly after twelve till two o'clock; every point being fully discussed in a very friendly manner. The delegates commenced by stating that Mr. Henry, the General Secretary of the Coal Porters' Union, had no authority to speak for them, and had nothing whatever to do with them. They distinctly asserted that the men now on strike could not return to work with the new hands, as the rules of the Union forbade them. They were told that it was impossible for the Directors even to think of turning away the new hands to make room for them. The delegates then suggested that the profit-sharing scheme at the end of a twelvemonth should be abolished; but Mr. Livesey replied that he could not entertain the idea. Any arrangement about the scheme would have to be made between the Company and the men who had accepted it. It had always been the intention to form a Committee; and this would have been done before then if it had not been for the present trouble. This Committee would have settled all details. The men's representatives withdrew all objections to the old yard-hands, but reiterated that they could not work with the new men. They were asked to put themselves in the place of the latter; and they admitted that the decision of the Board to support the recruits was right. Mr. Livesey added: "We must go on. We have wanted to do what was right all through; and we intend to pursue the same course. We have no unfriendly feeling towards the old hands; and if vacancies arise they shall have them, if they will. We are holding our hands; but we cannot continue to hold them. For the vacancies that exist or may occur, we are now in the position of selecting good stokers; and we have declined an offer from Salford. The men were warned that the vacancies would become fewer every day. They declared that they could not work with non-Union men; and I replied 'Well, you can't come back.'" With the thorough understanding that the Company were determined to stand by the men who had come to their aid in a time of emergency, the deputation withdrew; their last words being that it would now be a matter for the four Unions of stokers, coal porters, lightermen, and sailors and firemen to deal with collectively. On Wednesday evening the stock of gas had greatly increased; the large three-lift holder in the Old Kent Road being quite full. Additional pressure was put on, street work was resumed, and all departments were gradually getting back into the routine which had been so seriously interrupted by the exit of the old hands. There was stated to be abundance of coal in store; and with regard to the threatened stoppage of supplies by sea, no ship had been kept back up to then. Vessels were arriving in their proper order; and as the discharging was slower than customary, the skippers and their men were to be liberally compensated. The new men were to be frequently seen outside the works; but the police had no trouble. Another procession, with bands and banners, made up of the various branches, paraded the principal South London thoroughfares with collecting-boxes. Ultimately they went to Southwark Park and held a meeting—Mr. W. Thorne in the chair—at which they were urged not to give way; and a resolution was passed condemning the bonus scheme. In the course of the day the Lord Mayor received a telegram from Mr. Henry, at Sunderland, stating that there had been no breach of the agreement between the coal porters and the seaborne coal merchants, as asserted to his Lordship and Sir J. Lubbock on the previous day. Permission was given for the discharge of the boats, respecting which the difficulty had arisen; but his Lordship was requested to acquaint the merchants that all subsequent boats would have to be manned by members of the National Union of Sailors and Firemen. This was rather an outside matter; but it bore upon the present position of affairs in view of the agreement, already referred to, entered into between the above-named Society and the Coal Porters' Union, to stop the supply of coal in English ships to the Company.

Thursday was rendered conspicuous by the issue of two important notices by Mr. G. Livesey to the workmen. In one he made known the result of the conference with the delegates of the Union men on the previous day—viz., their declaration that the men could not return to

work unless the new hands were discharged; and the Directors' determination not to desert the new men under any circumstances whatever. He then notified that, having allowed the old hands reasonable time to return, all vacancies would be at once filled up without delay. The other notice was as follows:—"The Directors cannot speak too highly in praise of all their loyal servants, from the chief officers down to the humblest labourer; every man during this trying time has done his very best, with the most hearty good will, to enable the Company to overcome the great difficulties attending the strike of the stokers. As they have so nobly stood by the Company, the Company will stand by every man who continues to do his duty. The new men must be remembered also, for without their hearty assistance the great work of keeping up the supply of gas could not have been done. These men, by their willingness to learn, their earnestness in working, and their cheerfulness under trying circumstances, have surpassed the expectations of the Directors. All the new men who are suitable for the work, and are willing to remain in the service of the Company, may consider themselves engaged for at least three months. The greater part will have work for a longer time; and the Company is ready to enter into engagements with 400 or 500 of them as permanent hands for constant employment. Those men who leave the Company in the spring and summer will have the privilege of returning in the fall of the year for full employment during the winter. Not one of the new men, either at present or in future, will be discharged to make room for any of the old stokers who have gone out on strike. All the men, old hands and new, who stand by the Company will, when the difficulty is over, receive a gratuity of £2 for the first week, and £1 for each succeeding week, in addition to their wages, as stated in the bills and advertisements." These notices gave the greatest satisfaction to the new men; and during the day the work of making agreements with such of the suitable men as desired to remain in the Company's service for the next three months or longer was commenced; it being understood that the three months' engagements would entitle the men to a proportionate share of the bonus scheme. At the Rotherhithe works the coal difficulty was regarded as settled. There were two steamships waiting in the Thames to be unladen, and a better class of men had been found to take the place of the raw hands who were put to the work of unloading the *Newton* early in the week; so that greater expedition in the coaling of the stations was confidently looked for. So much progress was made in the production of gas on Thursday, that in Bermondsey and Rotherhithe the lighting of the streets was commenced before four o'clock; being at least an hour earlier than had been done during the previous few days. It may be mentioned here that the insufficient lighting of the streets, which had been one of the inevitable results of the action of the discontented workmen, had aroused the indignation of certain local Vestries—viz., Bermondsey, Rotherhithe, and St. George the Martyr—who, early in the week, passed resolutions in favour of bringing pressure to bear on the Company to compel them to fulfil their contracts in this respect. This action was regarded as being a little premature; and the Newington Vestry and the St. Saviour's Board of Works declined to be parties to it.

As some "capital" has been made out of the alleged expression by Mr. George Livesey of his intention to "smash the Union," he has sent an explanatory letter to Mr. J. G. Rhodes (member of the London County Council for the Northern Division of Southwark), who had asked as to the truth of the report, and also for general information respecting the bonus scheme and profit-sharing arrangement. In the course of his letter Mr. Livesey stated: "I never made the foolish remark that I would 'smash the Union.' It arose in this way: Some stokers refused to oil the levers of the retort-lids; and on my speaking to them about it, they said they were told by the delegates of the Union not to do this work. They also said it did not take five minutes, and that they had no objection to do it. Then came some talk about the Union, when I said, 'I don't think your Union will last twelve months.' The talk was of a perfectly friendly character on both sides; and this was the origin of the report you refer to, and which has caused much mischief. I must do the leaders of the Union the justice to say that, on my explaining it, they did their best at all our works to contradict the report." Having given particulars of the origin and purpose of the profit-sharing scheme, Mr. Livesey added: "We have altered the condition of the agreement from 'a fixed twelve months' to not less than three months, though we have had no new agreements printed with this alteration, because we have been too much occupied; and the men do not seem to desire the shorter term. This strike has compelled us to defer the appointment of the Committee referred to in the scheme. It is the intention to settle all details, as to agreements and working, by that Committee as soon as it is formed; but that will not be before Christmas.

The position of affairs was practically unchanged on Friday. It was reported by the Company that at six o'clock in the morning the gas in the various holders amounted to 20 million cubic feet, or nearly sufficient to meet a night's demand, without taking into account the quantity which would be produced during the day. The strikers, notwithstanding the aid of the Coal Porters and one of the Sailors' Unions, did not succeed in stopping a ship carrying coal to the Company. Indeed, it was stated that the sailors on board one ship, when appealed to, said they would prefer leaving the Union to relinquishing their situations. There was also some difference between two Unions in the North of England; and it was declared that one Union, acting in concert with the coal porters, was endeavouring to crush another body of a similar character, but of longer existence. It was also reported that the men engaged at the pits were disinclined to enter into the dispute; and, such being the case, the Directors of the Company did not anticipate any real difficulty in procuring coal. The notices issued by the Directors in respect to the filling up of vacancies had some effect—a number of the old hands having applied for re-employment. At the Union Committee-room, beyond mere detail, little business was transacted. Some of the leaders were away in the North endeavouring to restrict the Company's coal supply; but the men said little as to what their future course of action would be.

The following vote of thanks and confidence in the Chairman and Directors of the Gas Company was passed on Thursday by those who have signed the profit-sharing agreement at the East Greenwich station:—"That we, who have signed the profit-sharing agreement, express our entire confidence in the scheme, and thank the Chairman and Directors for it, believing it to be a wise arrangement for the mutual benefit of the employer and *employé*, and will tend to prevent such unhappy occasions as the present strike, which entails so much misery and bad feelings."

The following letter, addressed to the Chairman of the Company by the Strike Committee, embodies the latest proposals of the men up to the close of the past week:—

"Sir,—At the present stage of the existing dispute we desire, with all due respect, to record our views of the exact truth as it appears to us, and to embody them in the appended conditions which we would suggest with a view to an ultimate conciliation. We desire to make it known that we went out on strike with no object of gaining an increase of pay, or for any motive of self-interest, but on a simple matter of principle. We are of opinion that the bonus scheme in question, however much its detail may be subject to revision, was formulated purely in order to break the Union, and to prevent all combined action on the part of the men; but we are aware that this does not appear on the surface. In our eyes it was nothing but a seductive, though most plausible, bribe to throw dust in the eyes of the men, but, at the same time, to morally destroy the Trade Union, and strike a blow at the independent action of the *employés*. The friction has lasted and gradually developed since the formation of the Union; and though in all other Metropolitan Gas Companies there has been perfect friendliness and good feeling, in our particular case the strike has been rendered unavoidable all along. We have no objection to the bonus system to be mutually agreed on; and we are not blind to the benefits accruing from a combination of capital and labour. But we earnestly protest against the severity, approaching to regrettable severity—that the honourable services of several years are forgotten, and new servants are recklessly employed, without due consideration of their grievances or re-establishment of the old hands. The following are the conditions referred to:—"Clauses 1, 2, and 3.—That these be withdrawn for the following reasons:—(1) That the twelve months' service not being terminable for all the men on the same day, there would be at no time more than a few men at liberty to take any combined action to resist aggression of any kind. (2) That these clauses also compel the men to serve the Company in any capacity; thus compelling coal porters in time of dispute to do gas stokers' work, and *vice versâ*, and break the rules of their Unions. (3) That the bonus is a matter that might be easily settled between employers and *employés;* but while the bonus cannot be got without binding the men to clauses 1, 2, and 3, it would destroy the men's independence and break the Union. (4) That, recognizing the danger of having the work of gas factories liable to cessation at a week's notice, we desire that, in cases of dispute involving the possible stoppage of all work, a month's notice be given for consideration and settlement by employers and employed; failing any settlement, that the ordinary week's notice be given to cease work. (5) That all men who have come out go back without reservation or distinction.

"In laying these views before you, we only express our earnest hope that a reconciliation may be rendered possible, and that you will give this letter your careful consideration. We cannot forget the attachment which we feel to our old employers independent of this dispute, and that nothing would give us greater satisfaction than a return to our previous good relations."

The document was signed, on behalf of the Strike Committee, by Mr. Mark Hutchins (Chairman) and Mr. George Davis (Secretary).

Here, for this week, our chronicle of this important labour movement in the Metropolis will close.

Collapse of the Strikes in Manchester and Salford.

Containing our chronicle of the progress of the strike movement in the above-named places from the point at which it stopped in the last number of the JOURNAL, we have to report that the position of both parties to the dispute had not altered very materially at the close of the week ending the 14th inst. On the one hand, it was stated by Mr. C. Nickson, the Superintendent of the Manchester Corporation Gas Department, that many of the old hands—something like 30 or 40—had been re-engaged; whereas the Union pickets put the number at about a dozen. Mr. Nickson further stated that vacancies, as they occurred, would be offered to the old hands; though among the latter there seemed to be a general determination to "hold out." With regard to the supply of gas, although it was acknowledged that there was an improvement, and the stock was perceptibly increasing, there was a considerable falling off from the normal condition of things. The make on Sunday, the 15th, was about 11 millions, as against the usual 15 millions, and the quantity stored in the holders at six o'clock in the evening was 6¾ millions. Unfortunately, the prevalence of fog in the district tended to militate against the efforts of the officers and men at the works to increase the quantity and pressure of the gas to any great extent. The strikers held meetings and had processions through the streets; collecting money for their wives and families on all occasions. In Salford, as in Manchester, the fog was all against the Gas Committee, their officials, and their new hands. The efforts of Mr. Shoubridge and his staff were taxed to their utmost capacity to cope with the difficulties of the situation. However, he had every confidence in his men, who were stated to be a fine body of fellows, and rapidly becoming proficient in their duties. As to the old hands, up to six o'clock on Sunday evening, 19 applications to resume work had been received; but as there were then 30 men beyond the usual number employed at the works, little hope of re-engagement could be held out to them, especially as the fresh hands showed no disposition to make way for a return of their predecessors. Entertainments and services were held at the works for the edification of the new men. As stated last week, much discontent was beginning to make itself apparent among the strikers at the non-success of their movement; and disapproval was openly expressed at the conduct of the leaders. At Salford many of the stokers who were "out" were heard to declare that they would have nothing more to do with the Union.

In view of the position of affairs above described, the District Council of the Union held a meeting on Sunday night, at which it was decided that all the men who were out might take their chances for the remaining vacancies. This decision was an open acknowledgment of the absolute collapse of the strike. In pursuance of this authorization, the men made an unconditional surrender on Monday; and with it the entire organization, including the picketing system, came to an end. In the afternoon, from 500 to 800 men assembled in the vicinity of the Manchester Town Hall, and, as far as possible, applied for work individually. The Gas Sub-Committee were obliged to give an absolute refusal to labourers; but other applications were considered. Eventually upwards of 20 experienced men were engaged for the Gaythorn station, and 34 for the Bradford Road works. The Committee then adjourned until the following morning, with an understanding that inquiries should be made in the meantime as to whether it would be possible to employ more men at these stations. It was thoroughly understood that there were to be no displays of feeling between the old hands who were re-engaged and the men who took employment at the commencement of the strike. The latter, if they desired it, continued to live on the premises a little longer—the intention being to end the system gradually; but the others would board and lodge at home as hitherto. The density of the fog which prevailed again on Monday was inimical to increasing the bulk of gas in stock. At two o'clock the holders at the three stations in Manchester contained 8,740,000 cubic feet. But at four o'clock the quantity had been reduced to 8,360,000 cubic feet; and at six o'clock it stood at only about 8,000,000 cubic feet. At Salford there were constant applications by the old hands to be allowed to resume work; and groups of them stood about the entrance to the Regent Road works, anxious to discover whether any of the new men were coming out. They were unanimous in declaring that they had been entirely led astray.

They had not, they said, received anything whatever from the Union, notwithstanding the assurance that they were to get 10s. per week. The collection made by themselves, when divided, came to 1s. 4d. per man; and this was all that many of them had to get though the week with. They did not seem inclined to blame those who arranged the negotiations which led to their coming out so much as the promises of aid, which, so far, had proved entirely false. The men stated that they had no idea they would be left so utterly in the cold; their leaders having represented that 60,000 persons were ready to submit to a levy on their behalf. Many of them had paid from 2s. 6d. to 3s. 6d. into the funds themselves; and then to be told that there was only 1s. 4d. for them aroused feelings of positive disgust. They wanted to know where the money had gone to. It was reported that only about £112 had been received as the result of the collections above referred to; and of this a sum of about £31 had not been handed into the office. The Branch Secretary, who had the £31 in his possession, did not make his appearance at the rooms of the branch on Monday morning, and was not to be seen during the day. One of the late strike hands, who had applied unsuccessfully to both the Manchester and Salford Gas Departments for work, made the following statement to a representative of a Manchester paper:—"I have been thrown out of work twice this winter owing to this Union. I was employed in Manchester when the strike began; and, along with several of my fellows, I should have remained in if I could, but we were compelled to come out. It was in another place that I lost work before; and I not only spent all I had in order to get here with my family, but I pledged nearly every article of furniture I possessed. At that time my three children had boots to walk in; but this second disaster, following so rapidly after the first, has reduced us to a state of poverty which I trust I shall never see again. My wife and children are now crying out with hunger, and I have spent every farthing I have. This morning I got 1s. 4d. from the Union; and that sickened me as well as many other old stokers. We consider we have been treated shamefully by these Socialists and Unionists, and many of us mean to try to get work elsewhere." This many of the men have since done.

On Tuesday afternoon the Gas Sub-Committee were again in attendance at the Manchester Town Hall, to consider the applications of the men who presented themselves for re-engagement; and large numbers of the most suitable candidates were taken before them. About two dozen were engaged for the Gaythorn and Rochdale Road stations; and it was intimated that a few hands would be required to complete the manning of the Bradford Road works, as, in view of the public requirements, it was intended to make the most of this station. The other two stations, it was stated, were amply provided with men. The Sub-Committee stated that they could have filled all the vacancies earlier if they had desired; but, seeing how events were likely to go, they really wished to keep a few places open for the old hands. The gas supply to the city was again curtailed, owing to the fog; but it was by no means bad compared with what had been experienced. The quantity of gas in stock was very low in the morning; and at four o'clock there were only 7,600,000 cubic feet in the holders, as compared with 8,660,000 cubic feet on the previous day. With regard to the men out on strike, they still hoped for a contribution from the London office of the Union. The Secretary who disappeared mysteriously after receiving £31 to distribute in strike pay, was still missing, although inquiries had been instituted as to his whereabouts. At the Manchester Police Court two men, named Coffey and Taylor, members of the Union, were committed for two months, with hard labour, for violently assaulting Thomas W. Burgess on the night of the 13th inst. Prosecutor was one of the stokers who had come out on strike, but had repented; and the attack on him and a companion was made by the accused, who were the ringleaders of a mob, just as they reached the gate of the Bradford Road works in a cab. At Salford, there was a very perceptible improvement in the lighting in the evening; while the quantity of gas in store was considered satisfactory.

On Wednesday, the Manchester Gas Sub-Committee engaged 55 more of the old hands; and then declared their labours at an end. Altogether, about 100 or 120 of the strikers had been re-engaged, and the whole of the works were stated to be fully manned. The make of gas had visibly improved; but, in view of the possibility of further heavy fogs, and of great demand for gas in the whole of the Christmas week, it was still found necessary to curtail the supply and effect other economies. The quantity of gas in stock in the afternoon was 7,800,000 cubic feet, as compared with 7,600,000 on the previous day. The Committee decided to continue housing and lodging the workmen for a few days longer. At an adjourned meeting of the City Council held in the afternoon, the Mayor (Mr. Alderman Mark), referring to the difficultes which had arisen from the dispute with the gas workmen, expressed the thanks of the Council, and especially of the Gas Committee, to the inhabitants for the forbearance they had shown, often under circumstances of great inconvenience and considerable loss. Sir John Harwood, in the absence of the Chairman of the Gas Committee, remarked that he would only say how much he appreciated what the Mayor had said. Sympathy with the distressed families of the men who had recklessly thrown up their work now began to take definite shape. A Relief Committee, composed for the most part of Manchester and Salford clergymen, held a meeting under the presidency of Canon Stowell, who was appointed Chairman of the Executive, and requested to ascertain from the Manchester and Salford Gas Committees the number of old hands out of work, the number who had applied for re-appointment, and the number likely to be taken on. The men themselves were also to be interviewed. It was likewise resolved to ask the District Provident Society whether they would undertake, under any conditions, the administration of a fund, should it be decided that a special fund was necessary. The Dean of Manchester was present; but as some misunderstanding had arisen owing to the position he had taken up as an advocate of unionism among the men, he deemed it advisable to withdraw. A meeting of influential gentlemen was also held at Hulme, when it was resolved to form a Committee to obtain funds for the relief the men lately employed at the Gaythorn works. At a largely attended assembly of the District Council of the Union held in the evening under the presidency of Mr. T. Prince, a motion was submitted to the effect that in view of a resolution adopted at a meeting of stokers in Salford, passing a vote of censure on Mr. Horrocks, he should no longer represent the Union as its District Organizing Secretary. Before the motion was put, Mr. Horrocks asked the meeting to accept his resignation. Several of the delegates stated that they had been deluded by Mr. Horrocks into the belief that they were entitled to 10s. a week as strike pay, when they were not entitled, when the strike took place, to a single penny. Eventually, an amendment was proposed to the effect that Mr. Horrocks should be suspended from the duties of his office until an investigation had been made into his conduct by a Committee. On a division the amendment was declared to have been carried. Three of the delegates were appointed as the Committee of Investigation.

On Thursday, the Manchester Gas Committee were able to improve the lighting of the streets—a larger number of lamps being lit than on any previous day in the previous fortnight. The quantity of gas in stock in the afternoon was about 8,000,000 cubic feet—a slight improvement upon the previous day's figures. It was decided that the lodging and provisioning arrangements at the various gas-works should terminate at the end of the present week. The excitement in Salford had almost died away. The strikers' practice of lounging about the entrances to the various works had been almost given up; and the police on duty had been reduced in consequence. Inside the works the new hands were making rapid progress in all the departments. A meeting of the Gaythorn Gas Workers' Relief Fund Committee was held in the evening, when a statement was made that £1000 would be required to meet the necessities of the 200 heads of families who were without employment. Subscriptions amounting to about £45 were afterwards announced.

As all the labour difficulties are now practically over, it may not be out of place to reproduce here a brief account of the doings of the leaders of the strike movement, as given in the *Manchester Guardian* last Thursday:—"For some days several members of the Executive of the Gas Workers and General Labourers' Union, from the head-quarters of the Union in London, have been in Manchester and Salford making inquiries into the circumstances under which the *employés* gave in their notices to the Gas Committees of the city and borough. They left for London yesterday (Wednesday) morning, taking with them various books and documents which it is hoped may throw light on the matter. A few days hence it is expected that a report will be received from the Executive; and a meeting of the Lancashire District Council of the Union will then be held to take such action as may be considered advisable on that report. Meanwhile, Mr. W. Horrocks has been suspended from the exercise of the duties of Local Organizing Secretary. The precise grounds for his suspension have not transpired. For one thing, the members of the local Council of the Union are very angry with Horrocks, and with Thorne, the General Secretary of the Union, for having promised that, in the event of a strike, they would receive substantial aid from the funds of the Union. The chief accusation which they make against Horrocks, however, appears to be that at the time the question of the handing in of the men's notices was under consideration by the Council of the Union, he represented to the members of the Council that if they decided to take such action, they would do so with the approval of the Executive in London, who would support them. It now appears that the Executive was never consulted with regard to the sending in of the notices; and that the members of that body who have been in Manchester this week state that, so far from approving of the strike, they would probably have at once put their veto upon it if an opportunity had been given them to do so."

THE SUFFOCATION OF TWO MEN IN A GASHOLDER AT BIRMINGHAM.

The Coroner's Inquiry.

As mentioned in our last issue, Dr. Winter, Coroner for North Warwickshire, opened at Saltley, last Saturday week, his investigation into the cause of the deaths of Thomas Case and James Chew, who lost their lives while repairing a holder at the Saltley Gas-Works of the Birmingham Corporation. Mr. A. Smith appeared to watch the inquiry for the relatives of Case, and Mr. Lane, instructed by the Boilermakers' Association, for those of Chew; while Mr. Barham and Mr. Henry Hack, M. Inst. C.E., the Engineer of the Saltley works, attended on behalf of the Corporation of Birmingham, and Mr. B. Shakespeare for the Leeds and North of England Insurance Company, upon whom Messrs. Clayton, Son, and Co. have devolved their legal responsibility. The bodies having been identified, Sarah Jane Case stated that Thomas Case was her husband; and that he was about 49 years of age. He had been working for Messrs. Clayton, Son, and Co., at the gas-works for six weeks. Mary Jane Chew, the widow of James Chew, said that her husband was 28 years of age. She thought he had felt afraid of the work; but he told her they were going to send for diving dresses, and then he thought it would be all right. Joseph Beswick, the foreman of the men, next gave evidence. He deposed to having been in the service of the contractors for from 15 to 16 years. On the day of the accident, Smith and Chew first went into the holder to see all was right; and afterwards Case and witness took their places. Case had on a diving dress when he descended, excepting the helmet, which he put on when they reached the raft. Witness only went down to mark the work for Case to do; and then he intended to return. Case wore the diving dress because he was going to stay down longer than the usual period. The deceased would probably have worked for twenty-five minutes or so, and then would have ascended, and transferred the dress to someone else, who would have gone on with the job. Witness was supplied with air by a tin box, which was placed over his head, with a pipe (supplied with air by a small pair of hand bellows) passing through the side of the holder. When he took the box off, he felt weak, and told Case they had better get back again. The raft was pulled to the ladder, but witness could not grasp it, and fell back in a fainting condition. He was not unconscious—he knew what ought to be done; but had not the strength to do it. Case unscrewed the glass off the front of his helmet; and witness obtained a little fresh air through the latter. Deceased then took his helmet off; but he (Beswick) tried to put it on him again, but had not the strength. He then fell on to the raft, and did not remember any more, until someone came down the rope ladder and shouted out. He could recollect being lifted up, and a rope placed round him; and when he recovered, he found himself on the top of the holder. Beswick then described the arrangements which they had made for signalling with the men outside the holder. There was a rope which should have been attached to Case's helmet, but they could not get it when they were on the raft; and he was to give as many pulls as witness was to give taps on the holder—three if they were all right, and four if there was anything wrong. If they did not knock or pull at all, the outside man would know there was something wrong. He had been in this holder about thirty times; and only once before had he known a man to become unconscious in it, and that was Smith. The foulness of the air in the holder depended very much on the state of the weather. It would have been safer to work in the holder if the water had been pumped out; but they were not aware that it was so bad as it had proved to be. He considered Mr. Hack was the Engineer on the job. Witness did not take any orders from him; but in any case of difficulty he went to him. The next witness was Richard Smith, who played a prominent part in the rescue of Beswick. He declared that he did not know of the signals; but he believed some were arranged. After Beswick and Case had been in the holder for twenty minutes, he became suspicious; and when he felt Beswick's air-pipe snatched from the bellows, he proceeded to the top of the holder, and called through the air-box. He then narrated the measures taken to rescue the men as already recorded; and told how Chew lost his life in taking part in their heroic attempt. George Newman, who was also at work on the holder on the day in question, stated that before Beswick and Case entered the holder the signals were explained to him. The inquiry was then adjourned to Thursday, when the last-named witness was recalled, and stated that he had not acted as signalman before that day. William Davis, who was working the air-pump for the diving apparatus, at the time of the accident, averred that he knew nothing about any arrangement

for signalling by knocks. The Works Superintendent at Saltley (Mr. J. W. Morrison) explained the steps which he took, directly on receiving information of the accident, to procure medical assistance, and to rescue Case and Chew. Mr. Henry Hack next gave evidence. He said he had been Engineer at Saltley for fourteen years. The work to be done to the holder consisted in putting a new grip to the outer vessel. During the early part of the year, in telescoping, the side of the grip and the cup came in contact; and upon examination it was found that this was due to the wear of the roller spindles inside, which prevented there being sufficient clearance between the two portions of the holder. In consequence of this, the two sides in cupping caught one another, and caused a fracture. He recommended the Gas Committee to have a wider grip put upon the outer vessel, which would give a greater clearance at the time of cupping. Messrs. Clayton's tender was the lowest but one; but it was accepted on his advice that it was better to engage a firm that had had a large experience in such work than one which had not been accustomed to undertake work of that character. Witness then produced the contract, and read a clause which the Coroner held completely freed the Corporation from any liability. In cross-examination, Mr. Hack said he did not think it necessary that the water should be pumped out of the tank for a job of that kind. Not one engineer in a thousand would have ordered it. The air would have been better if the water had been pumped out; but there would still have been very unpleasant effluvia from the sides of the tank, and the holder. He admitted, however, that such an accident would not have occurred if the water had been pumped out. To have emptied the tank would have been dangerous, unless other tanks had been emptied too. Questioned about the tin box which Beswick had contrived for himself, witness said the pressure in the holder was greater than the bellows could give; so that instead of Beswick being supplied with fresh air, the foul air was passing over his face and up through the air-pipe. Dr. W. G. Creswell, who was summoned to the gas-works on the occasion of the accident, deposed that Case died of poisoning by an asphyxiant gas, chiefly consisting of carburetted hydrogen; and Chew met his death by drowning while in a condition of unconsciousness caused by carburetted hydrogen. The Coroner, having reviewed the evidence, the jury, after an hour's deliberation, returned the following verdict:—"The jury find that James Chew and Thomas Case were accidentally killed at the gas-works, Saltley, while gallantly endeavouring to rescue their fellow-workmen; and the jury are of opinion that great carelessness was displayed in the signalling arrangements and the mode of exit." The Coroner afterwards called in Richard Smith; and, addressing him, said: I want to say publicly—and I am quite sure the jury join with me in this expression of feeling—that we consider your conduct was most brave, and that the feeling you exhibited as a plucky English workman in going down into that dreadful place to rescue your fellow-workmen does you the very greatest credit.

Up to last Saturday, there had been subscribed to the fund which has been opened at the offices of the *Birmingham Daily Post* for the widows and families of Case and Chew £126 9s. It is proposed to make some recognition of the bravery displayed by Smith, who, with Chew, went down into the holder, at such great risk to himself, to the rescue of his companions.

THE DEATHS OF WORKMEN AT THE LEEDS FORGE.

The Fatality Due to the Inhalation of Carbonic Oxide from Water Gas.

The inquiry into the circumstances attending the deaths of the two men, Henry Tennick and Richmond French, which recently occurred at the works of the Leeds Forge Company, as already reported in the Journal (see *ante*, pp. 1068, 1116) was resumed at the Town Hall, Leeds, last Wednesday, by the Borough Coroner, Mr. J. C. Malcolm, and brought to a close in the course of the day.

Mr. Besley and Mr. W. Warren appeared for the Leeds Forge Company; Mr. C. Mellor represented the proprietors of "Warner's Safe Cure," which the men had occasionally taken; and Mr. H. A. Child watched the proceedings on behalf of the relatives of the deceased.

Mr. Besley remarked that he thought it would be going out of their way to inquire into the merits of an invention like water gas. He took it that the investigation was as to the cause of death.

The Coroner acquiesced, but stated that it had been suggested on the former occasion that death had been caused by other means than water gas.

Mr. Besley said Mr. Warren desired him to state that he had been misunderstood on that point. He did not intend to convey that death had resulted from poisoning other than by water gas.

Harry Leach, a chipper employed at the Leeds Forge, testified to having been seized with dizziness when laying bare some gas-pipes on the works about 18 months ago. When he was attacked, he was about eight yards from the cabin where Tennick and French were found.

Thomas Prescott, a boiler maker and flanger, examined by the Coroner, said he was present when the bodies were found in the cabin. Whilst he was rubbing them outside, someone suggested that the men had been "gassed." He had only seen Leach (the previous witness) "gassed" before, and then helped the deceased Tennick to apply clay to his head; the idea being that if the person were suffocated the gas would go through him. The clay remedy was tried upon both of the deceased.

By Mr. Child: He had been 15 years at the Forge, and had not seen any notice warning the workmen how to use the gas.

Dr. *Stevenson*, F.R.C.P., Lecturer on Medical Jurisprudence and Chemistry at Guy's Hospital, Examiner in Forensic Medicine at the University of London, and Official Analyst and Adviser to the Home Office, then read his report on the analyses made, and on the *post-mortem* examination, as follows:—On the 24th of November last, on the instructions of the Home Secretary, I assisted at the *post-mortem* examinations on the bodies of Richmond French and Henry Tennick, deceased. The *post-mortem* notes, signed by Mr. Scattergood and others, as given at the inquests, contain an accurate statement of what I observed. During the course of the *post-mortem* examinations, I examined by an optical method of analysis, the blood taken from the bodies of both the deceased men, and obtained clear evidence of the presence of carbonic oxide in both. This gas is not a natural constituent of the human body. Later on in the same day, Mr. Bottomley, at the Yorkshire College, under my immediate supervision, and in the presence of Mr. Scattergood, demonstrated the presence of carbonic oxide in the blood of both French and Tennick, by the optical method of analysis and also by a chemical test. I removed, for examination, portions of the bodies [these were enumerated]. On Dec. 2 I forwarded to Mr. Pepper a portion of fluid from the base of the brain of Tennick, and blood from the right auricle of French; on Dec. 5 I forwarded him portions of the liver of Tennick; and on Dec. 9, sections of Tennick's liver and kidney. Two remarkable facts were observed: That the viscera and blood remained long free from putrefaction, and that the blood retained for nearly a month the rosy hue noted at the *post-mortem* examination. These observations point to the presence of carbonic oxide in the bodies. Repeatedly, and after many days, I have been able to ascertain that carbonic oxide was present in the blood of both French and Tennick. I determined the quantity of the gas in the blood from the right auricle of Tennick's heart, and found it to yield 0·03 per cent. by weight. This shows that the blood was pretty well saturated with carbonic oxide gas. This condition is incompatible with the continuance of life. French's blood was equally saturated with carbonic oxide gas, as shown by spectroscopic analysis. Blood pigment, charged with carbonic oxide, was present in French's body—in the fluid in the bag of the heart, the urine, and the contents of the stomach. The same blood pigment, charged with carbonic oxide, was present in Tennick's body—in the fluid in the pleural cavity, the urine, and in the contents of the stomach. The stomachs of both bodies, their contents, the urines, and the viscera, were all free from poisonous substances other than carbonic oxide. There was no alcohol present; nor was there any of "Warner's Safe Cure," which contains a readily recognizable substance. The men had died fasting; their stomachs being almost empty. [Dr. Stevenson next described the various articles found in the cabin, and sent to him for analysis.] I have read the evidence given at this inquest; and, taking into consideration the history of the cases, the *post-mortem* examinations, and the results of analysis, I have no doubt whatever that Richmond French and Henry Tennick died from carbonic oxide poisoning. There was no organic disease in French revealed at the *post-mortem* examination that would account for his death. His bodily organs were unusually healthy for a man of his years. Tennick's liver, which I examined microscopically, showed organic disease such as results from indulgence in alcohol. But he might, I believe, have lived for a lengthened period with such a liver; and nowhere in his body did I find such organic disease as accounts for his sudden or speedy death. The appearances in both bodies were characteristic of poisoning by carbonic oxide, which I find in the blood of both men in sufficient quantities to cause death. Carbonic oxide gas is a constituent of water gas, which usually contains about one-third of its volume of carbonic oxide. The Manager of the Forge works informs me that their gas contains about 40 per cent. of carbonic oxide. It is the most poisonous constituent of coal gas, of which it forms from 4 or 5 to 8 per cent., and of the fumes of burning charcoal, of which it forms perhaps from 5 to 10 per cent. It is also a constituent of the forge gas from iron-smelting furnaces. All these—coal gas, charcoal vapours, and forge gas—are highly poisonous, and have often caused death when breathed. The other constituents of water gas, the chief of which is hydrogen, are comparatively harmless when breathed. Carbonic oxide is a deadly gas. Its effects are insidious, because it is colourless, destitute of odour, and does not irritate the air passages, but rather acts as a narcotic. So that it may be breathed without any alarm being excited in the victim. One of its effects is to cause a loss of power of movement, and even of desire to make any exertion. Hence, a person getting under its influence may be powerless to escape from the poisoned atmosphere. It kills by a special kind of suffocation, even when present in the air in very small quantity. It does not suffocate in the ordinary sense of the term by filling the lungs with an irrespirable gas, but acts in a quite different manner. The blood contains a substance—hæmoglobin—which gives it its colour, and the function of which is to take up oxygen gas from the air in the lungs, and to readily give up this oxygen to the tissues of the body, to which the gas is essential. The hæmoglobin then goes back through the circulation to the lungs, to receive a fresh supply of oxygen gas. This hæmoglobin is hence called a carrier of oxygen, since it is the agent by which oxygen is carried from the lungs to the tissues of the body, which it supplies with that gas, and is in the process again rendered available for the taking up and carriage of a fresh supply of oxygen. When an atmosphere containing even small quantities of carbonic oxide gas is breathed, the carbonic oxide combines with the oxygen-carrier of the blood—the hæmoglobin—forming a fixed compound, to the exclusion of oxygen. The hæmoglobin is thus rendered incapable of taking up oxygen and carrying it to the tissues of the body. Moreover, the compound of carbonic oxide with hæmoglobin is a very stable body; so that the carbonic oxide is dislodged from it with great difficulty. The result, then, of breathing an atmosphere containing this gas is that the oxygen-carrier is gradually converted into a useless substance, which is incapable of carrying oxygen from the lungs to the tissues; and these in the end become as effectually deprived of oxygen as if the air passages were blocked up. When so much of the hæmoglobin is rendered useless as that the tissues no longer receive a sufficiency of oxygen to enable them to carry on the processes of oxidation necessary to life, death results. Under such conditions, removal into fresh air and the usual restorative remedies for suffocation by gases are of little avail. It is manifest that the want of odour, absence of irritating effect, the soothing or narcotizing influence which it exerts, and the property of the hæmoglobin of the blood to pick out, as it were, minute quantities of carbonic oxide gas from the atmosphere in preference to oxygen, and the consequent rendering of the hæmoglobin incompetent to act as a carrier of oxygen from the lungs to the tissues, all combine to render carbonic oxide an insidiously deadly gas. I have experimented on animals with mixtures of carbonic oxide and air. Four per cent. caused convulsions in a mouse in half a minute after its immersion in the poisoned atmosphere; and in a minute and a half the animal was dead. One per cent. manifestly affected a mouse in 1½ minutes, and in 5 minutes it had nearly lost the power of movement. In about an hour the animal scarcely showed any signs of life, though it did not die till the end of 1¾ hours. One-half per cent. killed a mouse in the same time. These diluted atmospheres, containing one and one-half per cent. respectively of carbonic oxide, did not cause convulsions in the mice immersed in them. My own experience is in agreement with that of others. It has been stated that one-tenth per cent. of carbonic oxide in an atmosphere is injurious. This corresponds to approximately one-quarter per cent. of water gas; and that a single ordinary burner of water gas turned on, but not lighted, in a closed room of 1500 cubic feet capacity, renders the atmosphere of the room deadly in an hour's time. Deaths from water gas in the United States of America have been of late frequently reported.

Cross-examined by Mr. Besley: When he said one-quarter per cent., he meant one-fourth of 1 per cent. Producer gas contained a large portion of carbonic oxide, and blast-furnace gas from 20 to 30 per cent. The odorization of water gas was essential, in his judgment.

By Mr. Child: He did not find any traces of odorization upon his analysis.

Mr. *T. Scattergood*, surgeon, was then recalled, and, in answer to the Coroner, stated that in his opinion the deaths had resulted from poisoning by carbonic oxide.

Mr. *J. B. Hargreaves*, surgeon, expressed a similar opinion.

Mr. *A. J. Pepper*, late Examiner in Medical Jurisprudence at the University of London, in conjunction with Dr. Stevenson, was the next witness. In answer to Mr. Besley, he said he was engaged by the Leeds Forge Company, after the deaths took place, to make an exhaustive examination of the works. The gas-main was exposed for 10 feet from the corner of the cabin where the men were found, and there was no leakage of gas. There was another main 9 feet away; but this, in his opinion, had no bearing upon the case. Gas was supplied to the cabin by a pipe

up the outside wall, and there were no defective joints. Inside the cabin were two gas-jets and a stove, which burned 20 feet per hour when at the full. He agreed with Dr. Stevenson that the deaths of the men had been due to the inhalation of carbonic oxide. Even if, through any circumstances, there were only a small leakage of the gas, the carbonic oxide would tend to accumulate in the blood and cause death.

By Mr. CHILD: In his opinion, at some time of the day there had been a greater escape in the cabin than could have taken place with the tap in the position shown to him. The ventilation, he thought, would otherwise have tended largely to carry off the gas. It was possible, with the tap only turned on slightly, and with the ventilation afforded, that the odour of mercaptan or pyridine in the gas might not have been perceived. He was satisfied the odorizing arrangements were in perfectly good order, both at the site of the plant and 150 yards away, in the band-room.

By Mr. BESLEY: The stove was at the very lowest level of the pipe in the cabin, and there could not be any water to obstruct it. The placing of a can upon the hole on the top of the stove was calculated to put out the light. He had tested the ventilation of the band-room, and found it to contain 39,000 cubic feet of air, which, by the aid of the ventilators, was entirely changed in 39 minutes in an ordinary day.

By the CORONER: The greater part of the gas which might escape in the cabin would pass out, and only a small quantity would be diffused.

Dr. *Stevenson* said the gas was composed of almost equal parts of hydrogen and carbonic oxide. The carbonic oxide was a little lighter than the air, and the hydrogen was 14 or 15 times lighter. In the absence of air currents, the lighter gas would diffuse much more rapidly than the denser gas, so that the hydrogen would go farther than the carbonic oxide. Each gas would diffuse independently of the other.

Mr. BESLEY said he did not propose to call any more witnesses; but the Forge Company did not wish to keep anything back, and would put in the box anyone whose attendance was desired.

At the suggestion of Mr. CHILD, the last witness was asked whether, supposing there had been a pipe attached to the opening in the top of the stove, the whole of the gas would not have been drawn away.

Dr. *Stevenson*, replying to the question, said if there had been such a pipe, which there was not, it would not have acted effectually unless the gas had been lighted. It would have carried a portion of the gas away, but it would have left a poisonous atmosphere. If parts of the jet had been lighted, a great part of the escape would have been carried away if there had been such a pipe.

The CORONER then proceeded to sum up. He said that he must advise the jury that there was nothing to justify a suspicion of culpable negligence on the part of any one. If they found, however, that there was anything dangerous about the works, it was open for them to throw out any recommendation which they thought would avoid future difficulties. Their only real duty was to find the cause of death; the other matter, with regard to any recommendation, being purely voluntary. He proceeded to review the evidence, and pointed out that the Forge Company had formed the impression, through the newspapers, that alcoholic poisoning was the cause of death; and that, although the man Taylor knew, at the first sitting, that the gas-tap in the cabin had been left turned on, he did not divulge it. If this had been done, the whole matter might have been settled in half-an-hour, as the case would have been treated as an ordinary death from asphyxia caused by an escape of gas. Four witnesses had spoken to the tap being turned on; and yet, although they had this knowledge, they did not divulge it, and the inquiry was allowed to drift into an elaborate and expensive examination which might have been avoided if this information had not been kept back. In conclusion, he said the jury were not obliged to make any recommennation unless they thought it necessary. It was a scientific question as to whether the use of water gas was dangerous, and it should only be dealt with by a scientific body.

Mr. BESLEY said the first day that Taylor was called he understood he was merely to give skeleton evidence for the purpose of the burial certificate. On the second occasion he said the tap was turned on.

The CORONER: This man Taylor, as an inspector and foreman, ought to have explained the whole business.

Mr. BESLEY: He had not the least idea of keeping anything back; he was under the impression that he would be called again.

The CORONER: There were other officials of the Forge Company present, and the Solicitor for the Company said he should be able to prove that the men had not died from water-gas poisoning. I do not wish to press this too hard; but the jury cannot shut their eyes to the fact that the stove was spoken of at the time we viewed the place, and not the slightest disclosure was made of the tap being turned on.

The jury then retired. After an absence of about half an hour, they returned and handed in the following unanimous verdict:—"We find that the two men, French and Tennick, died from inhaling carbonic oxide, arising from water gas, which, we consider, at the time was not sufficiently odorized to enable them to detect it."

The inquiry then closed.

A NEW PUMPING-ENGINE FOR THE BATH WATER-WORKS.—At the meeting of the Bath Corporation Water Committee last Thursday, the tender of Messrs. Stothert and Pitt for £925 was accepted for a new pumping-engine to be put up at the Charlcombe station.

WAKEFIELD CORPORATION WATER SUPPLY.—The minutes of the Water Committee presented at the last meeting of the Wakefield City Council stated that it was proposed to give notice of the Committee's intention to appeal against the assessments of the water-works in the townships of East and West Ardsley. The minutes were approved. At the same meeting, a letter was read from Alderman Lee, who, on the 11th ult., was appointed Chairman of the Water Committee, declining the office, and further desiring that his name be struck off the Committee. The Council consented to the withdrawal of Alderman Lee; and elected Mr. Milnes to take his place.

ACCIDENT TO A GAS-MAIN AT NEWPORT, MON.—In connection with the construction of some new railway works at Newport, Mon., a gas-main was fractured last Sunday week, by which the lives of several people were imperilled, though, happily, the results proved less serious than was at first expected. The accident was brought about by the shifting of a heavy signal post. To facilitate the removal, some iron bars were driven into the roadway, to which ropes were attached. In the course of this operation, early on Sunday morning, a 4-inch gas-pipe was struck, and was broken; and the gas, percolating through the ballast, of which the roadway was composed, entered two or three of the nearest houses, and it was some few hours before any alarm was caused. Slight danger was done in two of the houses; but in the third, three of the daughters of the occupier were rendered unconscious, and were almost suffocated. Towards evening, after receiving medical treatment, all three fortunately recovered. Mr. T. Canning, the Engineer of the Gas Company, took speedy steps to have the pipe repaired.

THE SHEFFIELD CORPORATION AND THE GAS COMPANY.

The Provisional Order which the Sheffield United Gaslight Company have made application for to the Board of Trade came before the Sheffield Town Council at their meeting last Wednesday. It was explained by the Town Clerk that, in addition to taking power to erect new works, the Company asked for permission to alter the dates of their half-yearly meetings if they thought well, and to be relieved of the £900 as the maximum amount to be paid to the Directors in any one year. If the clause were passed, the shareholders, he said, might vote such an amount of remuneration for the Directors every year as they might think fit. By another clause, it was proposed to substitute 100,000 cubic feet for 500,000 feet, so as to enable the Company to make special contracts with consumers of 100,000 feet; whereas now they could only treat with consumers of the larger quantity. Authority to create retiring allowances for the officers and servants of the Company was sought. This would involve, the Town Clerk believed, about £260 per annum. A further clause related to the amount of contribution by the Gas Company towards the superannuation fund; and it would be observed that they were not to contribute a sum greater than the amount which had been subscribed by their servants. Alderman Gainsford proposed that the consent of the Council be given to the Company's application; and he mentioned that the three nominee Directors were unanimously of opinion that the proposals in the Order would be—certainly in some respects—to the advantage of the ratepayers; and they unanimously supported its adoption. The proposition having been seconded by Mr. Osborn, an amendment was moved by Mr. Merrill, and seconded by Mr. Styring, that the matter be referred to the Parliamentary Powers Committee to report upon. The Council were reminded by Mr. Rawson that the Company made a great deal of profit out of the town, and that there were provisions in their Act to the effect that, after a certain maximum, the public should get the benefit of increased profits. His impression was that some of the proposals now made were purposely inserted to prevent the public getting the benefit of a reduction in the price of gas. Alderman Gainsford failed to see that the Order would have the effect Mr. Rawson suggested, but, on the contrary, thought most of the powers sought would be beneficial to the consumers. As to the remuneration of the Directors, this was fixed at £900 in 1855, since which year the sales of gas had increased 820 per cent.; and the amount of paid-up capital had advanced from £179,000 to £660,000. It seemed only reasonable that, with such an increase in responsibilities, their remuneration should be raised. With regard to the superannuation fund, the maximum contribution which the Company would make was expected to be £260 a year. On the question of the fees of the Directors, Mr. Osborn pointed out that the Chairman of the Company gave an amount of time and work to the management which anybody who succeeded him could not be expected to do for the present remuneration. Alderman Clegg suggested that some limit should be fixed to the fees. The amendment was agreed to.

BIRMINGHAM CORPORATION GAS SUPPLY.

THE ACCIDENT AT SALTLEY—CONCESSIONS TO WORKMEN—COST OF COAL—THE LIGHTING OF COURTS.

At the Meeting of the Birmingham City Council last Tuesday—the MAYOR (Mr. F. C. Clayton) in the chair—the Gas Committee submitted a report, an abstract of which appeared in the JOURNAL for the 3rd inst., p. 1071.

Alderman POLLACK, in moving approval of the report of the Committee, said he had to express his great sorrow at the tragic event which occurred at the Saltley works the previous week. Repairs to the gasholder became inevitable. The hydraulic cup leaked; and if it had remained in that state, it would have been a source of great danger. Under the circumstances, it was decided to substitute the old cup by one 2 inches wider. Tenders were invited; and on this occasion the Committee, knowing what responsible work gasholder repairing was, departed from their usual practice of accepting the lowest tender, and entrusted the work to a firm of great experience and repute, at a figure considerably higher than another tender which the Committee had under consideration. Messrs. Clayton and Sons, in a very stringent agreement, undertook all and every responsibility in connection with the work. He could not leave the subject without paying a tribute of respect to the memory of the brave men whose generous and manly endeavour to assist their mates ended so disastrously for themselves. Referring to the experiment at the Windsor Street works with inclined retorts on Coze's system, he announced that it had been so successful that the Engineer (Mr. Hunt) had been authorized to make further trials with them. As to the substitution of eight for twelve hour shifts in the labour of the carbonizers, &c., at the works, he explained that this was quite distinct from what was usually called the eight-hour movement, which proposed to confine labour in all handicrafts to eight hours a day. The question with which the Committee had had to deal related to continuous day and night work performed in day and night shifts of twelve hours each. That system had been in operation at most gas-works hitherto. The Committee had long thought it was desirable to curtail the hours of attendance of the men; and the only way to accomplish it was to substitute three shifts of eight hours. This, however, involved a reorganization of the works, with a considerable bill for additional wages; and it had not been demanded by the men, who had asked rather for a reduction of work than a reduction of hours. Under these circumstances the GAS COMMITTEE, although feeling that the solution of the question was near at hand, did not feel called upon to take the lead in the matter. The action, however, of the London Companies brought the question to sudden maturity; and even before the memorial on the subject was received from the men, they had asked their Engineers to prepare a report with regard to it. The Committee decided not to reduce the wages of the men, and, in fact, they had slightly increased them; but it was manifestly impossible to ask them to do in eight hours as much work as they had previously done in twelve, and of which they had complained. The question of readjusting the labour was, however, by no means easy of solution. The Engineers recommended, and the Committee authorized them to offer, a reduction of 17 per cent. in the work they had done previously, but this did not prove satisfactory; and in order to arrive at a settlement, some further concession was made. He was glad to say that the new system had now been in operation for seven weeks, and had given satisfaction to the men, who looked upon it as a generous concession on the part of the Gas Committee. On the other hand, the Committee were fully aware that the men in their turn were anxious to assist them and the Engineers in the successful carrying on of the work of the department. The second matter to which he desired to allude was the increase in the price of coal. This was of a twofold character—there was the increase of price itself, and the withdrawal of the rebates on carriage which had hitherto been allowed by the railway companies. The railway companies contended that the Railway and Canal Traffic Act prevented them from allowing these rebates, because they would form a preferential charge; and they seemed to look upon gas companies and gas undertakings as common traders. They had promised, however, to renew the rebates if the Railway

Commissioners would rule that it was not a breach of the Act. The Gas Committee were co-operating with other similar bodies in endeavouring to bring about this result. If they were not successful, the increased price which they had to pay for coal in the year ending July, 1890, and which amounted to £26,000, would be still further increased by £11,000. He need hardly tell the Council that so large an addition to their expenditure, together with the increased cost of iron tubes and all kinds of materials, and the prospect of a further rise in coal, and the increased cost of nearly £15,000 for wages, must act very adversely on the trading account of the department. Against these advances they had certainly something in hand in respect of the increased price of coke, and also some advance in tar; but it was a very serious matter, and had already prevented the Committee recommending, as they had hoped to do, a reduction in the price of gas on the 1st of January next. If coal still continued to rise, they might have to increase the price of gas; but they would be very reluctant to do this if it could be avoided.

Mr. Bloor, in thanking the Committee for the magnanimous way in which they had treated the gas stokers, said he wished to point out that the Committee were paying no more for labour than in the period from 1873 to 1878—in fact, he did not know if the men were not doing rather more work for the money.

Sir T. Martineau remarked that they were all very much shocked by the account of the lamentable accident which had recently occurred at Saltley; and the public would be glad to have a little more information on the subject. He should be glad if Alderman Pollack would inform them whether the question of pumping the water from the gasholders before the men were sent in to do the repairs was fully considered; and, if it was, whether there was any insuperable difficulty in the way.

Alderman Avery said, with regard to the increased charges which the Gas Department had to bear, he should be glad to have some further assurances as to the ability of the Committee to continue the contributions which they had hitherto made in aid of the rates, and that without any large increase in the price of gas.

Mr. Jacobs said he was surprised to hear of the probability of an increase in the price of gas, since he should have thought that the profits the department had made out of the high price hitherto charged would have provided them with means to get over any temporary pressure.

Alderman Pollack asked to be excused from saying much upon the accident at Saltley, as it was at present before the Coroner; and the responsibility would no doubt be ultimately put upon the right shoulders. It would have been impossible to empty the gasholder at the present time, as the three other adjoining holders would also have had to be emptied; and at this time of the year, they required all the storeage they could command. He did not believe that one engineer in a thousand would specify that the gas-tank would be emptied when repairs were required of the nature of those mentioned in the contract, and no demand had been made by the contractors in respect of emptying it. There was a very stringent agreement that Messrs. Clayton and Sons should undertake the entire responsibility in connection with the work, including responsibility for any injury to the workmen whom they employed. With regard to Alderman Avery's question, the Committee were very anxiously considering the increase in their expenditure; but they could not make reliable estimates of next year's prospects until the end of this year, which in other respects had been a good one. He might point out for the information of Mr. Jacobs that, in addition to the contribution of £25,000 in aid of the rates last year, the Committee placed £15,000 to the buildings account, and £15,000 to the reserve fund —making practically £55,000 profit last year.

The report was approved.

At a later stage of the proceedings, there was a lengthy discussion, initiated by Mr. Granger, on the old question of lighting the courts. The resolution proposed by him was—"That it be an instruction to the Public Works Committee to take into immediate consideration the question of lighting the courts and terraces of the city, so as to secure the lighting of all such courts and terraces not at present lighted; and also to consider the advisability of putting into force the existing statutory powers set forth in the Town Clerk's report on this subject, presented to the Council on February 1, 1887, and to report to the Council their recommendations." On every conceivable ground—moral, social, and physical—he considered it necessary the courts should be lighted. They were told that it would require a capital expenditure of £32,000, to provide the lamps, and that the lighting itself would cost £10,300 a year. On the question as to who was to pay, Mr. Granger would not commit himself. In the course of the discussion, the Town Clerk advised that an inspection of the courts should be made, and the worst of them selected as a test case; the first requisite being the provision of the means of lighting. It could be ascertained, by the legal proceedings that would ensue before the Stipendiary, whether or not the Birmingham Consolidation Act of 1883 carried with it the lighting. Subsequently, Mr. Jarvis proposed, as an amendment—"That it is desirable in the interests of the health and comfort of the inhabitants of the courts and terraces within the municipal area of the city, that the said courts and terraces should be lighted at the cost and under the control of the city authorities; that in view of the difficulties that would arise in carrying out this proposal, as pointed out by the Town Clerk in his reports to the Council on February 1, 1887, and July 3, 1888, it be an instruction to the Public Works Committee to consider the matter, and report as to the best means to be adopted to secure the above object without declaring the courts and terraces public highways or streets." Mr. Granger's resolution was supported, among other prominent members, by Alderman Pollack, who remarked that, if the landlords consented to light the courts, a much heavier burden would be cast on the Corporation than upon them, because the landlords would only be called upon to pay 23s. 6d. a year for lighting and maintaining each lamp; whereas the actual cost would be 31s. If the whole of the 6323 courts were lighted, the cost to the landlords would be £7427, and to the Corporation £9800. The Council declined to accept the amendment; and Mr. Granger's resolution was carried unanimously.

Explosion at the Preston Gas-Works.—A serious explosion occurred late on Sunday, the 15th inst., in the cellars below the purifier-room of the Preston Gas-Works. A man named Wilkinson entered, leaving a light outside, to search for a leakage. He came upon an outrush of gas, and was overcome. While he was lying on the floor, the explosion occurred. The floor and roof of the room were blown out; and the damage to property is said to be considerable. Fortunately Wilkinson was not seriously injured.

The Lighting of Courts in Manchester.—The Manchester City Council, at their meeting last Wednesday, on the motion of Mr. N. C. Schou, instructed the Gas Committee, in view of the very large annual sum now paid out of gas profits and spent in the illumination of other parts of the city, to consider and report as to the best method of lighting cheaply, after nightfall, courts within the city uncondemned by the Unhealthy Dwellings Committee. Mr. Schou asserted that the additional expenditure for public lighting would only amount to about £900 a year.

LOTHAMMER GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Wednesday, at the Offices, No. 6, Lombard Court, E.C.—Mr. C. E. Parker Rhodes in the chair.

The Secretary (Mr. W. S. Ogle) having read the notice convening the meeting,

The Chairman said further examination of the Company's books showed that considerable sums of money had been paid out of the subscribed capital for transactions and matters for which the Company could in no way be held liable. With the exception of the unpaid calls, the whole of the cash capital subscribed had been paid away, although no genuine business in the development of the invention had been done. The two contracts mentioned in the prospectus were stated to be invalid, as they were made for another venture under a different name. The assignments of the foreign patents had not been made to the Company, nor were the Company in possession of the title-deeds of the invention which it was formed to work, and without which no sale of patent could be effected. Particulars as to the mismanagement of the undertaking which had resulted in placing it in its critical position would be found in the report issued by the Committee of Investigation (see *ante*, p. 1024). Acting under legal advice, they had caused an action to be entered in Chancery to have the so-called contracts rescinded, and the vendors' shares cancelled. The invention was well worthy of being developed, and offered a really safe investment for a small capital towards which several voluntary offers by cash subscribed had been made. For very urgent reasons, they could not but recommend the shareholders to consent to a voluntary liquidation. The proposition to wind up the Company was with a view to its reconstruction or re-formation, or to the formation of another Company, for which a scheme would have to be prepared. He concluded by moving—"That it has been proved to the satisfaction of the meeting that the Company cannot, by reason of its liabilities, continue its business, and that it is expedient to wind up the same; and that it be wound up voluntarily."

Mr. Cantwell, in seconding the resolution for the winding up of the Company, explained that, although there was some £1300 or £1400 unpaid on calls, he happened to know that in a very large number of cases they would be disputed on the ground of fraudulent misrepresentation.

Dr. Alexander suggested the advisability of adjourning the meeting for a short time, with a view of approaching the holders of the vendors' shares, to see if it would not be possible to come to some arrangement for carrying on the concern without going into liquidation.

This suggestion having been seconded, considerable discussion ensued, in the course of which several shareholders expressed their belief in the great value of the invention, and of its ultimate success if proper management was secured. Eventually it was decided that the meeting should be adjourned for a month; all litigation in the meantime to be suspended—the Provisional Board to approach the holders of vendors' shares, and also others interested in the success of the undertaking, with a view of endeavouring to extricate the Company from its present difficulties.

The proceedings closed with a vote of thanks to the Chairman and the Provisional Board, who were requested to continue in office.

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Offices, Commercial Road, Pimlico—Sir W. H. Wyatt in the chair.

The Secretary (Mr. G. H. Gill) read the notice convening the meeting and the Directors' report was taken as read.

The Governor: Gentlemen, it is my duty to move—"That the Directors' report be received and adopted, and entered on the minutes." I will just make a few observations on the report; and the chief point is in regard to our coal supply. That is a matter that has given us a great deal of anxiety in the past half year. First of all we had some difficulty owing to the action of lightermen in connection with the dock strike. We had no real, serious difficulty, but some anxiety as to keeping up the present supply. Our contracts were in force, but the contractors said they could not carry them out; and we therefore had to see in what other way we could obtain the coal we needed. Then came this more recent strike, which at one time looked far more serious, though it appears now to have passed away. The arrangements we made in consequence of these difficulties cost us more money. We had to use Welsh coal; but we felt that our first duty was to see that we should not leave our district short of water. I think we and every other company that uses coal—I am not speaking of water companies alone—owe a debt of gratitude to the Directors of the South Metropolitan Gas Company and their Chairman (Mr. George Livesey) for the firmness and pluck with which they held out against the coercion which was attempted to be used upon them. If they had given way, I think we should have been in a position of considerable jeopardy and difficulty; whereas it is now only a question of money cost, which we as Directors, and you as shareholders, are quite willing to bear, rather than that there should be the least difficulty in regard to the supply of water. This increased cost is unavoidable; for, so far as we are concerned, we cannot help it. I suppose, however, the present state of things will not last for ever, and that the time will come when we shall be again able to make favourable coal contracts. In the meantime, you may feel that the arrangements we have made, though at an additional expenditure, will render it certain that for some months at least—we cannot tell what may happen afterwards—there will be no difficulty as to our coal supplies. This, I think, is so far satisfactory. Our income has continued steadily to increase; and that is a gratifying feature. We thought that this would be the case, owing to the erection of larger houses in this part of the Company's district; and this is likely to go on. On the other hand, our expenses have risen slightly, but some of them will not occur again. We had a good deal of work to do in cleaning the reservoirs. I believe that our engines are now in the best possible order, and are not likely to cause us much outlay. I am afraid, however, that we shall have an increase in the cost of coal; but that, of course, we cannot help. I know our plant, machinery, and buildings now are in most excellent order; and I do not anticipate any very large expenditure under those headings. With regard to the action I referred to at the last meeting, arising out of the bursting of a main on Putney Hill, the parties have not yet gone to trial; and they do not seem anxious to do so. We can only hope that when they do, we shall be successful. It does not, however, rest with us to bring that action on. I believe they have taken the necessary preliminary step by serving us with a writ; but they have not gone further. The only other point to which I need call your attention, is the passing last session of the Act called the Trust Investment Act, from which I think we have already derived some benefit—that is, individually—not as a Company. The Act makes it legal, under certain conditions, for trustees to invest in debenture or preference stocks of water companies in the United Kingdom which have paid a dividend of 5 per cent. on their ordinary stock for ten years previously, if they are not forbidden to do so by the special instrument creating the trust.

The result of this has been, in our case, that our 4½ per cent. debenture stock has gone up from £130 to £142, which is, of course, a benefit for individual holders of stock, if they are desirous of disposing of it. This does not affect us in any way as a Company. At the price of £142, the stock pays about £3 3s. per cent.; and I think that this is pretty well established as its value in the market. It is unfortunate that all the alterations and improvements of which we hear, add very much to our rates; but this is a matter we cannot help. We find, however, that our rates are going up considerably; and if you could see the different amounts which we—a Water Company—have to pay for education, libraries, and to burial boards, you would find that they were very large. However, as I have just said, this is a matter we cannot control. On the whole, I think we are in a comfortable and satisfactory state, and it will be our endeavour to keep in this condition.

The DEPUTY-GOVERNOR (Mr. F. S. Clayton) seconded the motion, which was unanimously carried.

On the motion of the GOVERNOR, seconded by the DEPUTY-GOVERNOR, resolutions were passed agreeing to the past half-year's accounts being entered upon the minutes; authorizing the Directors to set apart out of the profits of the Company so much money as will be sufficient to pay the dividends, which will become due on the 5th prox. on the several preference stocks issued by the Company; and declaring a dividend for the half year ending September 30 last, at the rate of 9½ per cent. per annum on the ordinary capital stock, less income-tax, excepting only such holders of 4½ per cent. preference convertible stock as have converted their holdings into ordinary stock, and whose right to participate in ordinary stock dividend will take effect from Sept. 30 last.

On the motion of Mr. JONES, seconded by Mr. WALMISLEY, a vote of thanks was accorded to the Governor and Directors.

The GOVERNOR: We thank you very sincerely, Gentlemen, for this resolution. As I have said, we have had some anxiety during the past half year; but we have met with so much loyal support from the officers, who have displayed great anxiety to preserve the interests of the Company in every possible way, that we have not had anything like the same trouble we should have had if we had been working with an unwilling or disloyal staff. We shall endeavour to do our best for you in future.

The proceedings then terminated.

MID-SUSSEX WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held yesterday week, at Winchester House, Old Broad Street, E.C.—Lieut.-Gen. Sir JOHN STOKES, K.C.B., in the chair.

The SECRETARY (Mr. W. H. Hardy) read the notice convening the meeting; and it was agreed to take as read the Directors' report for the year ending Oct. 31 last. This stated that the permanent well was being proceeded with as rapidly as possible; and that the reservoir to contain 300,000 gallons had been completed. The other matters dealt with were referred to by the Chairman in the course of the proceedings.

The CHAIRMAN, in moving—"That the Directors' report be received, adopted, and entered at the foot of the minutes," stated that the Board commenced their duties rather more than a year ago, when they found that most of the preliminary steps had been taken for the purpose of carrying out the object of the Company—such as the selection of the site for the works and the point at which the well was to be sunk. They had pursued, with care and diligence, the endeavours made to procure a proper supply of water; and these endeavours had been successful, inasmuch as a good source of water had been reached; and the analysis of Professor Frankland showed it to be of excellent quality for drinking and other dietetic purposes. A boring had been made to the depth of 285 feet. The well had been carried down 58 feet; and to that depth had been lined with iron and brick. But seeing they had to continue this to a depth of 285 feet, it would be some weeks, and probably months, before the well was lined, and the machinery fixed for raising the water. In the meantime, they were preparing for the distribution of the water by laying mains, which had been done in one direction to the farther end of Balcombe. In the other direction, they had reached Cuckfield; and they were continuing the work as fast as they could get the pipes. They had received a great number of applications for water; and they hoped before long to have the whole of the district under supply.

Mr. R. C. NICHOLS, in seconding the motion, said that he visited the well on the previous day. The contractors had hoped to pursue the work with much greater rapidity; but they had been delayed, owing to their having tapped a spring which they had not expected to meet. This spring gave a good yield in the winter; but as it fell to a low point in the summer, they could not have taken their supply from it.

The resolution was carried.

On the motion of the CHAIRMAN, seconded by Mr. NICHOLS, Mr. R. B. Evered was re-elected to his seat at the Board; and on the proposition of Mr. J. RANDALL, seconded by Mr. HOUNSOM, the Auditor (Mr. W. G. Gribbon) was re-appointed.

An Extraordinary General Meeting was then held, to pass the following resolution:—"That the Mid-Sussex Water Bill, as proposed to be introduced into Parliament in the session of 1890, and identified by the signature of the Chairman, be approved and consented to by this meeting, subject to such additions, alterations, and variations as Parliament may think fit to make therein."

The CHAIRMAN explained that it was proposed to obtain powers to extend the Company's district of supply; and for this purpose they would require to raise further capital. This extension was proposed on account of applications they had received from the inhabitants of Crawley, Isfield, Worth, and Handcross; and if this additional area were added to their present territory, the works would then be situated in the centre of the district of supply.

Some questions were put as to the amount of capital it was proposed to raise; and these were replied to by the Solicitor (Mr. J. C. Couldwell) and the Chairman—the latter stating that the additional works required would cost about £10,000. A shareholder pointed out that only rather more than 2000 out of 7000 of the original shares had been applied for; and he was informed that a further 200 had been taken up since the issue of the report. It was also anticipated by the Board that the shares would be taken up more readily when the Company obtained the proposed enlarged powers.

The resolution was carried unanimously.

The usual acknowledgment of the services of the Directors and officers was then made, after which the proceedings terminated.

NEW PURIFYING PLANT FOR WORKINGTON.—The Workington Corporation have accepted the tender of Messrs. R. and J. Dempster, of Manchester, for a new purifier, 16 feet square, with the necessary fittings, for their gas-works.

SOUTH NORMANTON GAS-WORKS.—These works are being extended considerably; and the Directors of the Company have ordered from Messrs. R. and J. Dempster, of Manchester, a new telescopic gasholder with wrought-iron tank 50 feet in diameter; also a new exhauster and boiler.

THE EXTENSIONS AT THE WILTON CORPORATION GAS-WORKS.

As noticed in our columns at the time, the undertaking of the Wilton Gas Company was purchased by the Corporation last year. The supply of gas being insufficient, and the price high (5s. per 1000 cubic feet), the Corporation consulted Mr. N. H. Humphrys, Assoc. M. Inst. C.E. of Salisbury, who advised them that the whole plant was in a dilapidated state, and recommended the practical reconstruction of the chief parts of it. At this crisis, he said, boldness and energy would soon place them in a sound position, but any attempts in the way of patching would only result in annoyance, trouble, and loss. The expense of the improvements required would be comparatively large—some £1600. But the money could be raised at a low rate; and with the economy in working expenses secured by the new apparatus, they would be able to pay off all liabilities in the way of interest, &c., and at the same time maintain a sufficient supply of good gas, at a price of not more than 4s. 2d. per 1000 cubic feet. The Corporation accepted Mr. Humphrys' recommendation; and the extensions of plant were undertaken by Messrs. E. Cookey and Sons, Limited, of Frome, and completed early in the present year. They comprise a new retort-house and chimney, three beds of retorts (of five, three, and two), hydraulic main, and long 8-inch foul main; an upright condenser; an exhauster with ½-horse power gas-engine; a Cookey's patent washer; three purifiers, each 6-feet square, with centre-valve; new station meter and governor; new 6-inch connections and bye-pass valves, &c., throughout; a gasholder 40 feet by 16 feet, with brick cement tank and 8-inch connections; and a photometer-room fitted up according to the requirements of the Act of Parliament. At the last meeting of the Town Council the Finance Committee reported that the loans contracted for the purchase and extension of the gas-works—viz., £4350 charged on the district rate and district fund of the borough, and £1150 charged on the revenue of the gas-works and the district rate and the district fund—would be repayable on Jan. 30, 1909. To meet this liability, they recommended that a sinking fund should be formed by the investment of £209 5s. 10d. annually in the 2¾ per cent. Consols, which, with the compound interest accruing thereon, would make up the required sum. Mr. H. Street asked if the revenue from the gas-works would meet this amount. The Town Clerk (Mr H J. King) replied that practically the gas undertaking came into the hands of the Corporation on Jan. 1, 1889. They had spent an unusually large amount (£111) for repairs, which really went to pay for some of the new apparatus that was considered to come under the head of renewals, such as two out of the three beds of retorts, &c. They had paid one half-year's instalment of interest on the loan. The amount required to meet the interest and sinking fund would be £416 per annum; and he considered that, notwithstanding the unusually heavy expenditure, there would be a balance of £484 to the credit of the Gas Committee, as a result of the present year's working. The Mayor (Mr. W. J. Carse) said they had also reduced the price of gas 1s.—viz., from 5s. to 4s. per 1000 cubic feet. The Town Clerk said that, looking at these circumstances, there was every reason to believe that the gas-works would be self-supporting. The Council had simply obtained them for nothing, and at the same time had given the consumers a substantial benefit in the shape of a reduction in price. The recommendation of the Committee was carried unanimously.

THE ELECTRIC LIGHTING SCHEME FOR HASTINGS.

The Hastings Town Council are quite determined to proceed with their electric lighting scheme, provided they obtain the Provisional Order for which they have given notice of their intention to apply to the Board of Trade in the ensuing session. It will be remembered that they purpose utilizing the surplus power which will be available at their "dust destructor" station for driving the electric lighting machinery; and by so doing they hope that the installation will prove economical as well as an attraction to the town. The Lighting Committee of the Corporation recently paid a visit to the works, to see how the Borough Surveyor (Mr. Palmer) proposed to carry out his scheme. It appears that in addition to the surplus power of the destructor plant, two Lancashire boilers at the adjacent sea water pumping-station will be available for the generation of power from dusk till eleven o'clock. The destructor saves £200 a year formerly paid for fuel for pumping the sea water; and it is proposed to charge £150 of this to the electric lighting account.

When the subject was before the Town Council at their meeting on the 14th ult. (*ante*, p. 1023), those of the members who have an interest in the Hastings and St. Leonards Gas Company were precluded from taking part in the discussion. The Chairman of the Company (Mr. J. Brown, J.P.), however, has expressed his views on the matter in a letter to one of the local papers, in which he criticizes the figures in the estimates submitted to the Council on the above-named occasion. He deals with each item in the account of the cost of the plant, as already given, especially the engines, and comes to the conclusion that £10,000 will be nearer the cost than the £5828 put down. But it is in the working expenses that, in his view, the figures are astonishing. He shows this by comparing them with the actual working of the Electric Light Company now supplying the town. He says: "The Electric Light Company had 15 arc and 984 incandescent lights. Bring these latter into arcs at the rate of 20 candles to the one, and 300 candles (not 2000 as the Council pay for) equal 64 arcs. Now, these burn on an average five hours per night, while Mr. Palmer's are to average 11·50 per night—about double. To do this Mr. Palmer's fuel is to cost £250; the Electric Light Company's, £514. Mr. Palmer's wages, £341; the Company's (including Secretary's salary), £604. So that Mr. Palmer is to do double the work at half the expense. Again, he puts the cost of the lamps at £30. Now, it is well known that the Electric Company made no profit at that price, while burning five hours to Mr. Palmer's 11·50. No all-night working has been done at the price, except the Brush for one year, for the purpose of gaining a concession. They were paid £26; but refused to renew the contract. In Milan the charge is £68; in America, about £40. In small matters as well as large the same inaccuracy prevails in the report. The small gas-lamps to be removed are quoted at £4 10s. 2d., whereas the charge is only £4 4s. 2d. per annum. The 'Whitehalls' are quoted at £11 9s. 6d.; whereas only £10 13s. 8d. is charged. There are 67 'Whitehall' lamps along the sea-front line; he reckons 50. The cost of fuel can be reckoned another way. Each arc lamp requires 10 lbs. of fuel per hour. This comes to £950, while the report states it is to be bought for £250." Mr. Brown concludes by expressing doubt as to the wisdom of the Council embarking in an electric lighting speculation with the ratepayers' money. "If," he says, "the gentlemen comprising the Lighting Committee, instead of chattering about the light of the future and the benefit they are conferring on the town, would risk some of their own money instead of other people's—if, for instance, they each took a £50 debenture in the Electric Light Company—we might admire their honesty, however much we might deplore their judgment, in this matter."

In a report recently presented to the Town Council by the Lighting Committee, it was explained that the 50 arc lamps which it is proposed to put up would take from 60 to 70 indicated horse power to work machinery

sufficient to produce the light for them. The two boilers in connection with the destructor might be thoroughly relied upon to produce steam at 70 lbs. pressure for 40 indicated horse power, and this would be sufficient to run the machinery during the greater part of the night. It was proposed to switch out half the lamps at eleven o'clock; thus leaving 25 lamps to maintain from that hour until half an hour before sunrise—an average of 6½ hours. These would take from 30 to 32 indicated horse power. Coming to the figures in the estimates, the report was, in a measure, an answer to Mr. Brown's criticisms. It stated that the prices for the machinery were in excess of those actually quoted by first-class makers of special electric light plant. As regarded the maintenance estimate, with the exception of the item for the maintenance of lamps, it was well on the safe side; but the item mentioned should be increased to £300. A mistake as to the number of gas-lamps displaced and the prices charged had been made, owing to an assistant not carrying out instructions, and so the number which would be displaced was: 67 "Whitehall" lamps at £10 13s. 8d., £715 15s. 8d.; 55 small do., at £4 4s. 2d., £231 9s. 2d.; 15 electric do., at £30, £450—total, £1397 4s. 10d. The report concluded by stating that, in order to make quite certain of the figures, the Surveyor had consulted one of Mr. Ferranti's assistants, who had prepared an independent estimate which came out very close indeed to his own. Mr. Perrins, in moving the adoption of the report, remarked that the Council believed the cost of carrying out the work would in no way exceed the estimates. The report was thereupon adopted.

PLYMOUTH CORPORATION WATER SUPPLY.

The Harter Reservoir Bill.

Notwithstanding that, in the words of the Chairman of the Plymouth Corporation Water Committee (Mr. J. E. Moon), "thousands of hours" have been spent by the Committee in the close study of the question of constructing additional water-works either at Harter or the Head Weir, and that the results of their deliberations and investigations have been imparted to the Council and the public, opinion inside and outside the Chamber appears to be about equally divided in favour of the schemes. A meeting of the Council was held last Friday week, to confirm the Committee's proceedings "with reference to the promotion of the Bill in Parliament for the acquisition of the Harter site, and for powers to construct reservoir works thereon; and submitting for approval the Bill proposed to be deposited, with recommendations relating thereto, and recommending that the expenses incurred in relation to the promotion of the said Bill be charged on the borough fund and rate." A memorial was presented, signed by from 1200 to 1500 ratepayers, expressing an emphatic preference for the Head Weir project instead of the Harter. The confirmation of the Council's proceedings was moved by Mr. Moon, who informed the Council that power had been taken in the Bill for a covering limit of £150,000. While, he said, Mr. T. Hawksley's figure for the construction of a stone dam across the Harter Valley was £86,000, yet, according to parliamentary usage, and to the judgment of their Parliamentary Agents, and to the corroborative testimony of Mr. Hawksley, it was considered necessary to take a covering estimate of £150,000 to be safe in carrying out the work. The motion having been seconded by Mr. Barker, an amendment was proposed by Mr. Latimer—"That the application to Parliament for a Bill for the formation of a reservoir at Harter be postponed, to allow of the further consideration of the whole question." In support of his opposition, he pointed to the fact that they had had placed before them that day the amount necessary to cover all the expenses for the construction of a great work; and for the first time they learned that, instead of £86,000, as stated the other day, the figure was £150,000, for which they would apply to Parliament. Regarding Head Weir, the sum of £124,000, which it was estimated this scheme would cost a week ago, had risen now to £225,000. These matters required serious consideration. He did not say there was anything wrong; but they came upon them as a surprise. Alderman Nicholson, in seconding the amendment, declared that the increase from £86,000 to £150,000 had come upon him like a thunder-clap. Mr. Harris held that they did not know sufficient of the Harter site; and it had not been explored in the same way that the Head Weir site had. Alderman Wills denied that Harter had not been sufficiently explored; observing that eighteen pits had been sunk at each place, all of which had been personally investigated by Mr. Hawksley and Mr. Etheridge. Mr. Morrish remarked that he had attended the Water Committee's meetings for twenty years, and was perfectly persuaded that they had adopted the course they had with regard to Harter, because they were convinced that a reservoir there would be more economical, amply sufficient, and all that was needed. The Head Weir site had cost from £2000 to £3000 to prospect, while Harter had cost but £400 or £500 to do all that was necessary; and they had there a foundation at a shallow depth. Mr. Pethick stated that it was impossible that if a dam were built at Head Weir, where an excavation of an average of 31 feet was necessary, it could be done at anything like the same cost as at Harter. He believed that Mr. Hawksley was a long way within the mark in his estimate for the Head Weir site. He asked which site it would be more to Mr. Hawksley's interest to recommend? At Head Weir £50,000 more would be spent than at Harter, which would mean £2500 more commission to him. At the close of the discussion, which occupied a considerable time, the votes recorded on the amendment were nearly equal—19 for, and 21 against; on the original motion being put, the figures were reversed, and therefore the Bill as deposited by the Committee will be proceeded with.

South Durham Water Scheme.—The Sanitary Authority of the Auckland Union last Tuesday concluded an agreement with the Weardale Water Company for supplying water to Merrington and three adjoining townships at a cost of £8000; the covenant, of course, to be subject to the assent of the Local Government Board, who must first be furnished with full particulars of the scheme. The Authority are to bear half the cost of the entire outlay. The Teesdale Sanitary Authority wrote to signify their readiness to join a scheme, with the Auckland Authority, for supplying water to Tofthill, Lands, Butterknowle, and Cockfield; but it was considered that the proposal had come too late.

Proposed Extension of the Leeds Gas-Works.—At a meeting of the Gas Committee of the Leeds Corporation last Thursday, it was decided to recommend the Council to purchase 24,000 square yards of land for the extension of the Meadow Lane Gas-Works and other purposes, at a cost of about £8000. The land, which contains certain buildings, was formerly in the occupation of the Leeds Forge Company, and closely adjoins the existing gas-works, as well as being contiguous to the Midland and the Middleton Colliery lines of railway. The enlargement of the works is recommended at this place because no such increased provision is possible in the case of the York Street or the New Wortley Gas-Works. The acquisition of the additional land in question will also provide for the conversion by the Gas Committee of ammoniacal liquor into sulphate of ammonia, instead of as at present disposing of the liquor by contract.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

Edinburgh, *Saturday.*

Mr. A. Smith, the capable Manager of the Aberdeen Corporation Gas-Works, lectured on Tuesday night, on "Gas Lighting," before the Aberdeen Mechanical Society. His remarks were, of course, to a considerable extent historical; but he gave his fellow-citizens a large amount of practical advice upon the question of how to burn gas as well. On that subject, he calculated that the waste of gas through insufficient burning amounted, over the United Kingdom, to a sum of no less than £3,473,887 a year, of which, in Aberdeen, they were responsible for £13,000. The gas industry, he said, had fought with candles, with oil of every description, with electricity, and last of all with water gas; and he had no hesitation in saying that it would stand against them all. Water gas could not be distributed at a profit for less than 2s. per 1000 cubic feet; and if carburetted would cost more than coal gas. Mr. Smith's remarks about waste must have been a woful sound to the Aberdonians; for he was assailed with a series of questions on the subject, in reply to which he told them that, for one thing, the quantity of gas lost on account of inefficient gas-fittings was most alarming. He suggested that certificates to plumbers might insure better work.

The Forfar Gas Corporation last Monday had before them a request by their stokers for an advance of ½d. per hour upon their wages. They did not get the advance, probably because the finances of the Corporation would not permit of it; but they obtained a good deal of sympathy from the members, and a very material curtailment of their hours—from 84 to 56 hours.

What is described in the newspapers as "an old question" came before the Edinburgh Police Court on Thursday, when about 60 proprietors of house property were summoned for failure to light the common stairs leading to the dwelling-houses in their properties. The question is one which every now and again gives trouble in Edinburgh. Proprietors are obliged to supply fittings in common stairs, which, without light, would be most dangerous places; and tenants are obliged to provide gas, and to light and extinguish it. The difficulty with the proprietors arises when one or more of them decline to pay their proportion of the cost of fitting up the lights. When that occurs, and the fittings are not provided, the the whole of them are summoned, and frequently they are fined—both those who are willing to comply with the order of the Magistrates, and those who are refractory. In the case of the tenants, the difficulty arises when one of them fails to extinguish the light; and it is then cut off by the Gas Commissioners. Though sorely tried in this way, it must be said that the Commissioners, notwithstanding that to leave the gas burning entails a heavy loss upon them; are not severe; and in many stairs (there are no meters, the charge being in all cases by time), the gas burns many hours more than the tenants pay for. The treatment of the proprietors, however, has hitherto been somewhat harsh. Bailie Walcot on Thursday inaugurated a new policy, in ordering the Inspector of Lighting in future to bring before him only those who are refractory. The presiding Magistrate will then be in a position to deal more effectively with the delinquents, because he will not have his judgment warped by the knowledge that in inflicting a fine, he is punishing both the innocent and guilty. The question, he said, was always a most humiliating experience to him. That load should now be removed from his mind.

A curious dispute regarding water supply has broken out at Bonnyrigg, one of the small burghs immediately to the south of Edinburgh. Some years ago the Police Commission acquired statutory powers, under one of the Police Acts, to supply water to the inhabitants; and they then entered into a lease for three years with the Bonnyrigg Water Company to provide the supply. The lease expired at Whitsunday last, and was not renewed. For awhile there was no complaint on the part of the community; but on its transpiring that the Company's rate would be 1s. 6d., which is about 6d. per £1 higher than the Commissioners' water-rate had been, a number of the householders declined to take the water. There is, in consequence, a scarcity in some houses, and a great deal of outcry. The question has been raised in legal form, and it is in dependence in the Court of Session. The point to be tried is whether a Police Commission having once begun to supply water under statutory powers, is entitled, without the consent of the ratepayers, to stop the supply. The question at issue is a nice one for the lawyers, and its determination may be useful. In addition to the action against the Police Commissioners, another is threatened against the Water Company for having supplied water from a spring which was condemned by Dr. Stevenson Macadam nine years ago. An indignation meeting of the inhabitants was held on Wednesday night, at which this course was resolved upon; and the feeling on the part of both the Police Commissioners and the community is that the water supply should be in the hands of the Commissioners.

(FROM OUR GLASGOW CORRESPONDENT.)

Glasgow, *Saturday.*

The consumption of gas within the Glasgow city and suburban area of gas supply has for the month of December generally ranged from rather more than 15 million cubic feet to fully 16 millions, per 24 hours. In only one or two cases has it exceeded 16 millions; whereas by this time last December a maximum of 16,811,000 cubic feet per 24 hours was recorded, which was, however, the biggest day's consumption ever experienced, and quite 500,000 cubic feet larger in amount than the greatest consumption in a 24-hour period in the preceding winter season. If I am not mistaken, the greatest quantity delivered on any day this month was 16,018,000 cubic feet, which was sent out on the 6th inst. From these data it may be concluded that so far the month of December has been tolerably free from fogs.

As might be expected, the recent action of the Glasgow Corporation gas stokers and the concession made to their demands to the extent of reducing the working day from twelve to eight hours, without any reduction of the wages, has already begun to tell in the disbursements from the Treasurer's office. Of course, to get through the work to be done more men had to be employed, which means an increased outlay for wages. During the past fortnight the stokers and all other workmen employed at the three gas-works reached a total of rather over 1900; whereas in the corresponding fortnight of last year the number of *employés* was scarcely 1350. Then, again, the past fortnight's pay for the workmen at the three stations—skilled men, stokers, labourers, carters, &c.—amounted to just a little over £5000; while for the corresponding fortnight last year it scarcely reached £3450. In this connection, it should be mentioned that the greatest increase in the number of men has been made at the Tradeston works, from 378 to 640. Much of it, however, is due to the extensions and reconstructions lately made and still in operation. If one takes into consideration the number of workmen of all kinds in the employment of the Gas Trust—that is to say, those in receipt of daily or weekly wages—and including the gas-fitters, and the meter-repairing and pipe-laying departments, together with the workmen at the three gas manufacturing stations—their last fortnightly pay was rather more than £6060; whereas in the corresponding period of 1888

the pay was not much above £4400. It may be of interest here to mention that the pay for the men earning daily or weekly wages amounted to £90,361 3s. 9d. during the year 1888-9, while in the preceding financial year it was close upon £85,000—under rather than over that amount. The increase under this head for the last financial year was therefore somewhat over £5000, but when the balance is struck for the present financial year, it will be found that the increase in the wages account has been very materially augmented. Then there also comes in the question of raised salaries, as also the greater cost at which the coal contracts for the year were made; all this, be it noted, in the face of a reduction in the price of gas from 2s. 8d. to 2s. 6d. per 1000 feet.

The question of electric lighting is already threatening to become a very expensive one in this city, if powers are eventually obtained under the Electric Lighting Acts by the Municipality. Of course, the executive and administrative authorities must have for their guidance the services of a professional expert of high standing and of great scientific skill. The members of the Special Sub-Committee on Electric Lighting had this matter under consideration a short time since, and naturally enough bethought them to consider the propriety of putting themselves in the hands of Sir W. Thomson, who was practically at the very doors of the Town Hall. But, cautious Scotchmen as they are, they deemed it proper to ascertain Sir William's terms before actually committing their case to him as their scientific "guide, philosopher, and friend." They were mightily surprised to find that the services of the "greatest electrician of the century" are not to be had at the "price of an old song." I have not yet learned that Sir William is to be ranked as Consulting Electrician for the Glasgow Municipal electric lighting scheme when it ultimately takes the field.

During most of the present week there has been a much quieter tone in Glasgow pig iron market. To-day, however, it was somewhat stronger—a good business being done, chiefly in Scotch warrants, which advanced 6½d. per ton during the forenoon; while for Cleveland and hematite iron prices were each run up 4½d. per ton. There was a further advance in the afternoon in the price of Scotch warrants; up to 61s. 2d. per ton cash being paid. The changes in the prices of Cleveland and hematite iron were not so great.

For prompt shipment there has lately been a scarcity of coals; but otherwise the general features of the trade are not much changed this week, except that there has been a slow demand for house coal. Prices generally are firmer than they were.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 21.

Sulphate of Ammonia.—While there is no quotable change in values, the appearance of the market is somewhat quieter, due partly to the completion of dealers' requirements, and partly to the nearness of the holidays. Consumers, as a rule, do not care to increase their stocks at the close of a year. Prompt sulphate has, on the other hand, been offering a little more freely; many makers being desirous of not carrying their present production into the new year. But the high notions of producers have in many cases prevented business. All actual business is meanwhile at full prices, and quotations remain at £12 7s. 6d. f.o.b. Hull, and £12 5s. f.o.b. Leith and Liverpool. Nitrate is very depressed; the projected closing of the works during December having apparently not come to pass. The spot price remains at 8s. 4½d.

THE GAS CONSUMERS' PROTECTIVE ASSOCIATION.—A Company under this title was registered last week with a capital of £1000, in £1 shares, to protect consumers of gas, electric light or power, or water, against loss or damage in connection with the supply or consumption thereof.

SALE OF STOCK IN THE HARROGATE GAS COMPANY.—Last Thursday, Messrs. Renton & Renton sold by auction, at Harrogate, £400 "B" stock and £2000 "C" stock in the Harrogate Gas Company. The last dividend on the former was 11¼ per cent.; and on the latter, 10½ per cent. The "B" stock was sold at the rate of £252 per cent.; and £1200 of the "C" stock at £225 to £230 per cent. (an average of £227)—the remainder being withdrawn. On the same occasion £33 6s. 8d. of the Company's "A" stock was disposed of at the rate of £321 per cent.

OPPOSITION TO THE ELECTRIC LIGHT AT PORTSMOUTH.—A memorial to the Town Council has been promoted at Portsmouth on the question of electric lighting. After setting forth the expense and risk that would result from the initiation of the electric light for public use by the Corporation, it concludes as follows:—"Your memorialists therefore pray that the Council. . . . will not authorize the common seal to be affixed to the contemplated application or memorial to the Board of Trade for a Provisional Order; but that such steps may be taken as will, under proper conditions and restrictions, facilitate the introduction of the electric light in Portsmouth by a Company."

THE NORTHERN COAL TRADE.—There was a fuller demand for coal during the past week than for a very long period, and prices responded to the increased demand wherever there was urgent and immediate need. Steam coal was in request; and some users of it had to pay more than 11s. 6d. per ton for best Northumbrian coal. This price is an advance on recent sales—an advance that is remarkable when the season of the year is remembered. For that kind of coal depends largely on the export demand from the Baltic, which stops when many of its ports are closed. Gas coal has been in very strong inquiry; but the price has fluctuated more than it usually does, sales having taken place at from 12s. up to 13s. 6d. per ton free on board, and this in some instances for quantities to be added to supplies sold under contract at about 6s. per ton. In other words, the price has risen to double what it was when some contracts were entered into a year or so ago. The consumption of gas has been locally heavier than has been hitherto known; but as in the next few days some of the large works will be idle for the holidays, it may be expected that the period of largest use is now over for this year, though it will be a month or so before there is an appreciable reduction.

MR. A. C. FRASER ON COAL GAS.—On the evening of Tuesday, the 10th inst., a lecture on "Coal Gas: Its History and Progress," was delivered in the room of the Literary and Philosophical Society, Halifax, by Mr. A. C. Fraser, of that town, formerly Gas Engineer to the Bolton Corporation. After briefly referring to the history of coal gas, the lecturer said that it was now acknowledged to be by far the most valuable, the best, and the cheapest material for use in artificial lighting. Its most formidable competitor, in his opinion, was oil, because of its cheapness. The incandescent electric light perhaps came next; but he thought this would not compare with incandescent gaslight when cheapness and other things were considered. He exhibited a number of gas-burners of the old type and as at present used; showing that the latter have a much higher illuminating power, for the quantity of gas consumed, than the former. In conclusion, the lecturer spoke of gaseous fuel, and said that if this were generally used for heating purposes, it would not only entirely do away with the smoke nuisance, but would also effect a great saving. At the conclusion, a vote of thanks to Mr. Fraser was unanimously passed.

THE SUPPLY OF GAS IN SMALL QUANTITIES IN STAFFORD.—At the meeting of the Stafford Town Council on the 3rd inst., Alderman W. H. Peach, in moving the adoption of the Gas Committee's report, said it was intended to try a plan for supplying houses which were not rated at above £12 per annum with gas in small quantities. There were about 4000 houses in the borough, of which only about 2000 were supplied with gas. The proposed scheme was to fix a meter and fittings free of charge, and to sell the gas at the rate of 4d. per 100 cubic feet. The money would be collected weekly, and a special meter would be used which would indicate very small quantities. The report was adopted.

DEFECTIVE STREET LIGHTING AT CARDIFF.—At a meeting of the Lighting Committee of the Cardiff County Council last Tuesday, reference was made by the Chairman (Mr. Vaughan) to the large number of complaints which were continually made as to the defective lighting of the town. A great number of the lamps, he said, were damaged, and consequently were not lit, and the illuminating power of the others was not what it should be. In many cases the burners were broken. Several members supported the Chairman's remarks, and complained of the impurity of the gas supplied. After a long discussion, it was resolved that a special meeting be called for the purpose of considering the terms of the contract existing with the Gas Company, with a view of bringing about such an alteration as would give the Corporation better opportunities of checking the lighting, &c., of the public lamps.

BURNLEY CORPORATION GAS AND WATER WORKS EXTENSIONS.—At a special meeting of the Burnley Town Council on the 5th inst., Alderman Collinge moved that application be made to the Local Government Board to borrow £6000 for gas-works purposes; and the motion was adopted.—Alderman Sutcliffe then proposed another resolution relating to the borrowing of £18,000 for the purpose of the Cant Clough reservoir. The original Parliamentary estimate for the works was £61,000, but if the work could have been completed without a shilling extra, he believed the reservoir would have cost at least £82,000. He now estimated that the total cost would be £150,082; and he submitted the details making up that total. He had told the Engineer to put in every conceivable expense at the top price. The reservoir was an expensive one; but it would not come to more than the average for reservoirs in the kingdom. It would cost about £580 per million gallons. The resolution was adopted. Sanction was also given to the borrowing of £1000 for the purchase of pipes from the Padiham Local Board; and £5000 for costs in connection with the Burnley Corporation Act, 1889.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 1198.)

Issue.	Share	When ex-Dividend.	Dividend or Div. + Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	,,	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	110—112	..	4 9 8
100,000	20	28 Nov.	8	Bahia, Limited	20	19½—20½	..	7 16 1
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾—7	..	5 7 1
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 17 10
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	218—223	+3	5 9 10
125,000	,,	,,	9½	Do. New	100	158—163	+5	5 13 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	41—43	..	5 2 4
320,000	20	27 Sept.	11½	British	20	43—45	..	5 0 0
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	12½—13½	−½	7 8 4
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13½	Commercial, Old Stock	100	242—247	+3	5 11 4
130,000	,,	,,	10½	Do. New do.	100	194—199	..	5 8 0
130,000	,,	28 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
557,320	20	12 Dec.	15	Continental Union, Limited	20	47—48*	..	5 8 4
242,680	20	,,	9	Do. New '69 & '72	14	32—34*	..	5 6 7
200,000	20	,,	10	Do. 7 p. c. Pref.	20	36—38*	..	5 5 8
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	26 July	13	European, Limited	10	22—24	..	5 8 4
120,030	10	,,	13	Do. New.	7½	17—18	..	5 8 4
354,060	10	,,	13	Do. do.	5	11—12	+½	5 8 4
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	248—253	+3	5 3 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	+2	3 18 5
30,000	,,	,,	6	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	157—162	..	4 6 5
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	248—253	+2	3 19 0
1,031,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	112—115*	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120—123*	..	3 13 2
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170*	..	3 10 7
8,800,000	Stck.	14 Nov.	12	Imperial Continental	100	213—218	+2	5 10 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115	..	4 6 11
541,920	20	28 Nov.	6	Monte Video, Limited	20	18½—19½	..	6 3 1
150,000	5	28 Nov.	10	Oriental, Limited	5	8¼—9	..	5 11 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5¾—6¼	..	5 12 0
166,870	10	26 July	4	Pará, Limited	10	4—5	..	8 0 0
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14½—15½	..	6 9 2
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	295—305	+5	5 6 6
1,350,000	,,	,,	12½	Do. B do.	100	330—335	+7½	5 3 1
141,500	,,	,,	12½	Do. C do.	100	240—250	..	5 6 0
600,000	,,	28 June	5	Do. 5 p. c. Deb. Stk.	100	138—142	..	3 10 5
60,000	5	12 Sept.	11½	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	265—270	..	3 10 4
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	211—215	−1	3 9 9
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	12 Dec.	9	Grand Junction	50	125—130*	..	3 9 3
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,048,800	100	28 June	9½†	Lambeth, 10 p. c. max.	100	256—261	..	3 12 9
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120—124	+1½	3 4 6
500,000	100	14 Aug.	12½	New River, New Shares	100	264—269	..	3 5 8
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,800	Stck.	12 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	167—173*	..	3 9 9
1,126,500	100	,,	6	Do. 7½ p. c. do.	100	163—168*	..	3 11 5
155,066	Stck.	12 Dec.	10	West Middlesex	100	260—265*	..	3 15 6

*Ex div.

† Next dividend will be at this rate.

THE GAS SUPPLY OF RAWMARSH.—The tender of £1475 by Messrs. R. and J. Dempster, of Newton Heath, Manchester, has been accepted by the Rawmarsh Local Board for the construction and erection of sundry cast and wrought iron works at the gas-works they are now putting up. Particulars relating to this contract were given in our advertisement columns a fortnight since. The district is at present supplied with gas by the Rotherham Corporation; and at the meeting of the Board last Wednesday, complaints were made as to the unsatisfactory nature of the supply. A deputation was appointed to wait upon the Corporation to lay the matter before them.

THE MANAGEMENT OF THE STAFFORD CORPORATION GAS UNDERTAKING.—At the last meeting of the Stafford Town Council, Alderman Peach referred to some statements which had recently been made at the meeting of the Gas Committee of the Stoke Corporation, which made it appear that, whilst Stafford made more gas than Stoke, the latter town obtained almost three times as much profit. This seeming inferiority of Stafford was, he said, easily explained. The profit obtained from the Stoke gas undertaking was lumped together in one sum, and so appeared in the accounts, whereas at Stafford last year the Gas Committee were able to hand over large sums in relief of the rates, for depreciation, and also to reduce their indebtedness by £1500. He also stated that the stokers' wages had been advanced 4d. per day, and the wheelers 3d. per day.

THE CONDITION OF THE PLYMPTON WATER SUPPLY.—Repeated efforts have been made by the Medical Officer of Health (Mr. G. H. Adkins) to obtain an inquiry by the Sanitary Authority into the water supply of the Plympton district; but hitherto he has been unsuccessful. The inhabitants, too, do not appear to attach much importance to his allegations as to the impurity of the water, seeing that, at a recent Vestry meeting, they rejected a proposal by the Authority to appoint a Committee to consider the matter. This was rejected at a meeting of the Authority last Friday week, when the Medical Officer again stated the grounds on which he claimed an inquiry. He said that each year since he took office he had reported the prevalence of diphtheria, typhoid, and other diseases, owing to the bad water supply. Not long since there was a case of diphtheria; and soon afterwards five cases of virulent typhoid fever. This prompted him to examine the water in the wells; and he found it polluted with sewage. The wells were so badly situated, and had such bad surroundings, that they could not at times escape contamination. The Authority took a sensible view of the matter; and at once appointed a Committee to institute inquiries so as to satisfy all parties.

MR. W. ARNOTT ON COAL AND ITS PRODUCTS.—On the evening of the 15th ult., Mr. W. Arnott, Manager of the Woodstock (Cape Town) Gas-Works, gave an instructive lecture upon "Coal and its Products," before a large meeting of the Presbyterian Church Young Men's Guild, Woodstock. The lecturer said that, in a general sense, the term "coal" included all varieties of carbonaceous minerals used as fuel. After giving a brief account of the occurrence of coal in nature, he said the total quantity used annually in the United Kingdom was 170,000,000 tons; in America, 48,000,000 tons; in Germany, 85,000,000 tons; in Belgium, 17,000,000 tons; in France, 17,000,000 tons; in Austria, 4,700,000 tons; in New South Wales, 1,000,000 tons; and in other countries, 2,000,000 tons—a total of 310,000,000 tons. In South Africa there were no doubt large beds of coal, which had, however, up to the present time been merely "skimmed;" and although the coal was not to be compared to the English product, as it had so far been disclosed, yet no doubt when the mines were worked down to the depth of European mines it would improve in quality and texture. In the Transvaal, Mr. T. Newbigging, C.E., of Manchester, had been testing coal from the various mines, and had found that, out of 36 samples, seven or eight were good gas-making coal. The lecturer then proceeded to deal at length with the history and manufacture of coal gas, coal tar, and the different apparatus necessary in their production; and said that the student might be excused if he were tempted to believe that Shakespeare was inspired by an insight into the marvellous nature and qualities of coal when he wrote that one might find "tongues in trees, books in running brooks, sermons in stones, and good in everything." The lecture was illustrated by numerous beautiful and interesting experiments with aniline dyes, &c.

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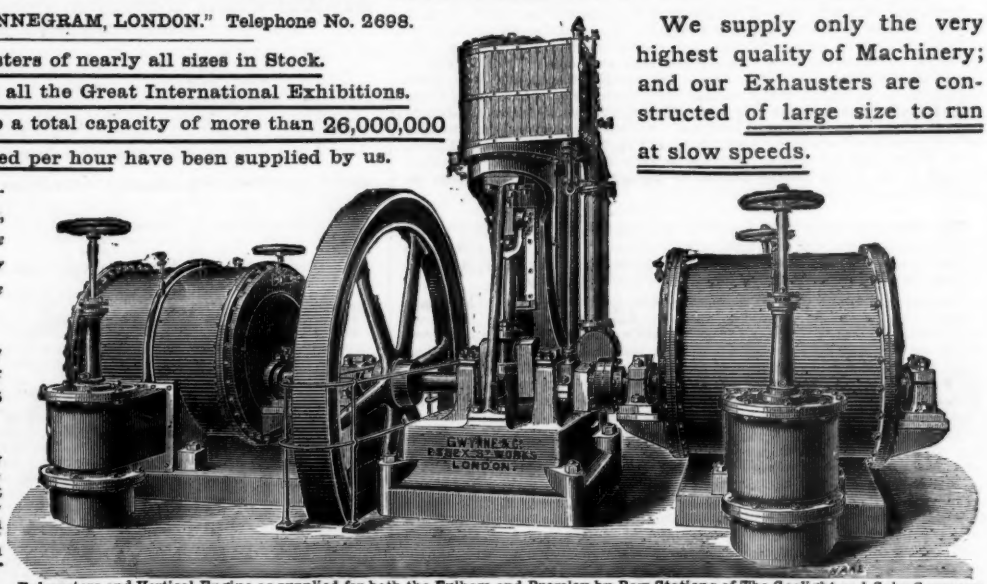

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Naphthaline.
Exhausters.
Steam Boiler and Engine.
Washers.
Scrubbers.
Bye-Pass Mains and Valves.
The Tar Well.
Purification and Purifiers.
Tests for the Detection of Impurities.
Station Meter House and Meter.
Pressure Gauges.
Pressure and Exhaust Registers.
Gasholder Tanks.
Gasholders.
Station Governor and District Governors.
Main Pipes and Distribution.
Discharge of Gas, in cubic feet per hour, through Pipes of various Diameters and Lengths, at different Pressures.
Service Pipes and Fittings.
Public Lighting.
Consumers' Gas-Meters.
Testing Meters.
Internal Fittings.
Bronze for Fittings.
Lacquer and Varnish.
Public Illuminations.
Coloured Fires.
Devices for Illuminations.
Illuminating Power.
Various Standards of Light.
Jet Photometer.
Specific Gravity of Gas.
The Use of Gas for Cooking, Heating, Ventilating, and Motive Power.
The Residual Products.
Applications of Sulphate of Ammonia, &c., in Agriculture.
Coal Products.
Chemical and other Memoranda.
Relative Value of different Illuminating Agents.
Calorific Power of Gases and other Substances.
Specific Heat of Substances.
The Gas Industry of the United Kingdom.
The Capital Employed in Gas-Works.
Sundry Useful Notes.
Co-efficients of the Cost, &c., of the Buildings, Apparatus, Machinery, and Plant of a Gas-Works.
Miscellaneous.
Office Memoranda.
Epitome of Mensuration.
Arithmetical and Algebraical Signs.
Approximate Multipliers for Facilitating Calculations
Table of Diameters, Circumferences, and Areas of Circles, and Sides of Equal Squares.
Weights and Measures.
French Weights and Measures, Decimal System.
Money Tables.
Alphabetical Index.

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ENFIELD GAS COMPANY AND TOTTENHAM AND EDMONTON GAS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the George Hotel, Enfield Town, on Wednesday evening, Jan. 8, 1890, at Seven o'clock precisely, in convenient Lots, 167 SHARES in the Enfield Gas Company, and £1050 "A" and "B" STOCK in the Tottenham and Edmonton Gas Company.

Particulars may be had of the AUCTIONEER, TOTTENHAM, and 8, NEW BROAD STREET, E.C.

TO INVESTORS AND CAPITALISTS.

THE KETTERING WATER-WORKS COMPANY. ISSUE OF NEW ORDINARY SHARES.

MESSRS. ROBINSON & SON are in- structed by the Directors to Offer FOR SALE by PUBLIC AUCTION, in Lots, at the Corn Exchange, Kettering, on Friday, Jan. 10, 1890, at Six o'clock in the Evening precisely, pursuant to the provisions of the Kettering Water-Works Act, 1889 (under which all new Shares are to be offered for Sale by Auction or by Tender before being offered to the existing Shareholders), 1000 NEW ORDINARY SHARES of £10 each in the above Company, part of an additional Capital authorized to be raised for the purposes of New Works now in course of construction, and which have been rendered necessary by the constantly increasing demand for the Company's Water, consequent upon the extraordinarily rapid growth of the Population and Industries of the Town.

For information as to the Company's position, its existing and new Works, and the Dividends lately paid on its present Capital, with printed particulars and conditions of the present issue, apply to the AUCTIONEERS; to Messrs. G. & H. LAMB AND STRINGER, Solicitors; or to the SECRETARY of the Company, all of KETTERING.

RAMSGATE CORPORATION GAS AND WATER DEPARTMENT.

THE Committee desire Tenders for the supply of a new STEEL BOILER, 27 feet long, 7 feet in diameter. Lancashire Type.

Full particulars on application to

WILLIAM A. VALON, Engineer.

TENDERS FOR TAR.

THE Newport (Salop) Gas Company are prepared to receive TENDERS for the purchase of their surplus TAR for One or Two years, from the 31st of December, 1889.

Contractors to find their own Barrels, and pay all Railway Carriage.

Tenders to be sent to Mr. R. N. Heane, the Secretary, Newport, Salop, on or before the 31st of December, 1889.

The highest or any other tehder will not necessarily be accepted.

THE Gas Committee of the Corporation of Heywood are prepared to receive TENDERS for the supply of RETORTS.

Tenders, endorsed "Retorts," must be delivered to me not later than Monday, the 30th inst.

Specification, quantities, and form of tender may be obtained upon application to the Manager, Mr. W. Whatmough.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
ALFRED WALLIS, Town Clerk.

Municipal Buildings, Heywood,
Dec. 18, 1889.

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply of the necessary CAST-IRON PIPES and CONNECTIONS, from 3 inches to 24 inches in diameter, required during the Twelve months ending the 31st of December, 1890.

Specification and form of tender to be obtained from the Engineer.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Jan. 11, 1890, prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst. C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Dec. 18, 1889.

HASLINGDEN UNION GAS COMPANY.

THE Directors invite Tenders for the purchase of about 60 tons of SPENT OXIDE.

Further particulars can be obtained upon application to the Manager.

Tenders to be sent in, addressed to the Chairman, not later than the 28th inst.

WOODCOCK AND SONS, Secretaries.

Haslingden, Dec. 11, 1889.

RETORTS AND FIRE-BRICKS.

THE Directors of the Rochester, Chat- ham, and Strood Gaslight Company are prepared to receive TENDERS for the supply of 1500 feet run of CLAY RETORTS, 20,000 FIRE-BRICKS, 100 TILES, and 20 tons of CLAY, according to specification and form of tender, which may be had on application at their Office, 58, High Street, Rochester, where tenders must be delivered before Noon of Thursday, the 2nd of January, 1890.

By order,
WILLIAM SYMS,
Secretary and Engineer.

Dec. 14, 1889.

TO GAS ENGINEERS AND MANAGERS.

THE Directors of the Plymouth and Stonehouse Gaslight and Coke Company are desirous of appointing a person as ENGINEER and MANAGER of their Works.

He must have a thorough practical knowledge of the Manufacture and Distribution of Coal Gas; also the Manufacture of Sulphate of Ammonia. Also to design and prepare Plans and Specifications, and carry out any new Works that may be required; and fully competent to undertake and direct the general Superintendence and Management of the Works, and devote the whole of his time and attention to the service of the Company.

The salary will be £350 per annum to commence with.

He will be required to reside on the Works, where a House, with Gas and Coals, will be provided.

Applications, endorsed "Engineer and Manager," stating age, qualifications, and enclosing testimonials as to character and ability, to be sent to the Secretary, on or before the 21st day of January, 1890.

By order,
JNO. THOMAS, Secretary.

Gas Offices, Plymouth Dec. 20, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

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Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

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CONSPIRACY and Protection of Pro- perty Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

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FOR USE IN GAS OFFICES.

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Chemist and Superintending Gas Examiner to the London County Council.

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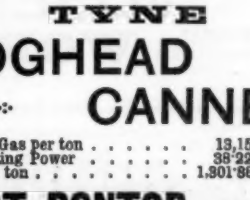

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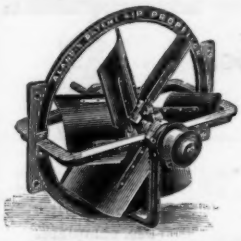

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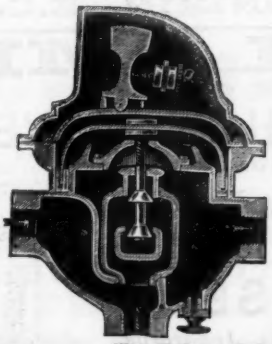

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PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

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Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected, including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

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NEWTON, CHAMBERS, & CO., LIMITED,
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

W. C. HOLMES & CO.,

CONTRACTING GAS ENGINEERS.

SPECIALITIES.

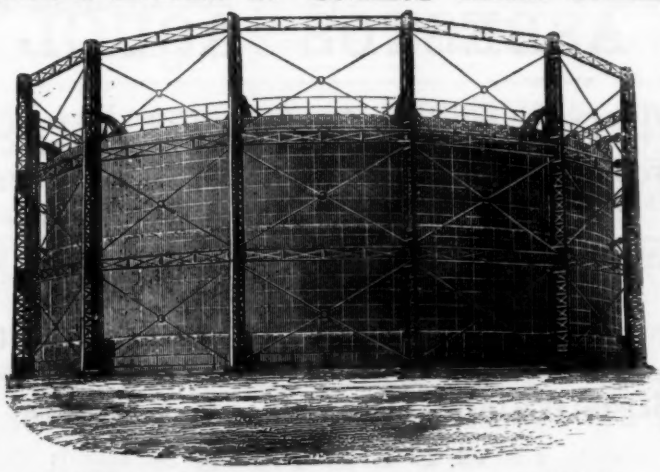
Patent Regenerative Retort-Settings.

Patent Rotary Scrubber-Washer.

Patent Reciprocating Exhauster.

Patent Regulator.

Patent Anti-Dip Pipes.



Treble-Lift Gasholder, 130 ft. by 60 ft., as erected at Burton-on-Trent.

SOLE MAKERS OF
DRAKE'S PATENT
GAS PLANT
Specially adapted for Country Places, and for mixing with Coal Gas to increase Illuminating Power.

Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

IMPROVED CHEMICAL PLANT.

WHITESTONE IRON-WORKS, HUDDERSFIELD,
AND
80, CANNON STREET, LONDON, E.C.

For Telegrams: "Holmes Huddersfield."

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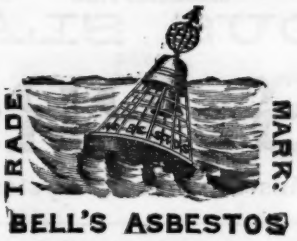
BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN and BARCELONA.

BELL'S ASBESTOS

EXPANSION SHEETING.

The above, which can only be obtained from this house, is recognized as the **most efficient and economical jointing material in use.** It is composed of a specially-prepared India-rubber Compound, protected by a covering of Vulcanized Asbestos Sheeting, as shown above; and as it is the only Jointing Material which adequately **combines permanent elasticity with heat resistance,** the advantage it possesses will at once be seen.

EXPANSION RINGS.

The centre from which the requisite elasticity is obtained will adapt itself to uneven surfaces to which it may be applied, and allow the expansion and contraction to be fully taken up. The covering being of Asbestos Cloth imparts a protection to the centre, and so prolongs its elasticity. **For Manhole, Mudhole, Steam Pipe, and Mash Tun Door Joints, it is unequalled;** and if applied as directed, **a ring can be used many times over.**

Made from 1-Ply for Cylinder and Faced Joints to any thickness for Uneven Surfaces.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

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LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
DUBLIN, BERLIN.

TRADE MARK.

BELL'S ASBESTOS.

DEPÔTS.

BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
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BARCELONA, and ANTWERP.

Southwark, London, S.E.

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YARN AND SOAPSTONE PACKING

Is the BEST LOCOMOTIVE PACKING made.

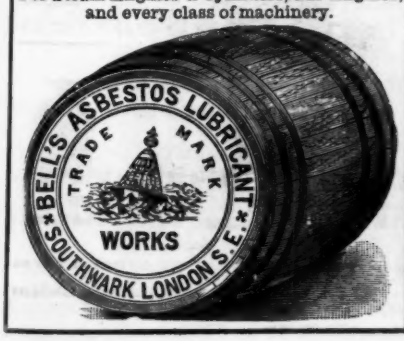
BELL'S

COMPOUND HYDRAULIC PACKING

Is specially suited for Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT

Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE

The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

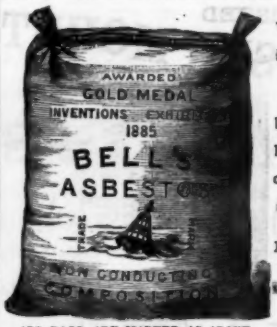
BELL'S ASBESTOS

"DAGGER" PACKING

Is unequalled for every kind of Marine and Land Engine, Steam-Pumps, &c., and has proved itself to be the most efficient durable, and economical Packing made.

BELL'S ASBESTOS

NON-CONDUCTING COMPOSITION.



Will reduce loss by radiation, and saves 40 per cent. of fuel.

Is suitable for boilers with flat or round bottoms. Is superior to any other, and saves its cost in a few months.

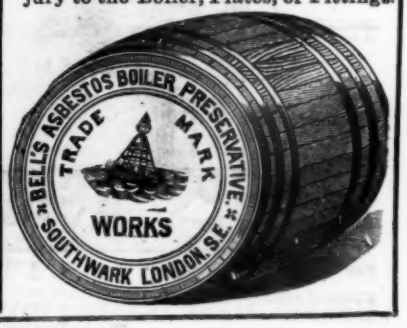
Is sent out dry in bags; therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS

BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



PATENT

Automatic Gas Extinguisher

(EDGE & TICEHURST'S PATENT).

Extinguisher shown fixed in Lamp.

An invention for automatically and instantaneously extinguishing Street and other Lamps at any desired time.

The Apparatus consists of a strong Train of Clock-Wheel Work with non-corrosive Spring, fitted into a strong Metal Case, which is screwed on to the top of the Gas-Pipe, in place of the Stop-Tap, inside the Lamp-Post. It is set in motion by the Lamplighter pulling down the Lever at the time of lighting the Lamp in the same manner as at present, which operation **winds up** and sets the work in motion.

The regulating as to the number of hours the Gas is required to burn is done from time to time by merely altering the Set Pins in the Segment.

The saving, both in Gas and Labour, by the adoption of this arrangement, particularly in places where both or either are costly, is self-evident.

Extinguisher.

PRICE 16s.

For large quantities, special quotations will be given.

Sole Manufacturer:

H. L. MÜLLER,

ALPHA GAS-MAKING MACHINE WORKS,

BIRMINGHAM.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

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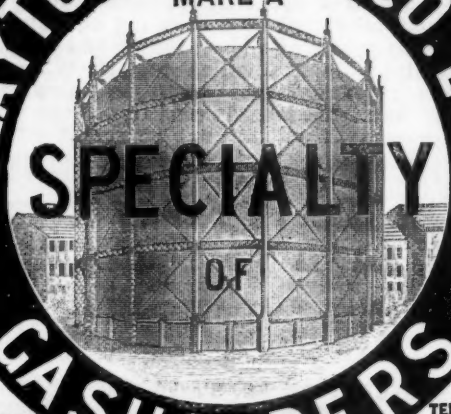
ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS: HUNSLET, LEEDS

LONDON OFFICE: 60, QUEEN VICTORIA STREET E.C.

CLAYTON SON & CO. LTD.

MAKE A



SPECIALTY OF GASHOLDERS

AND MAKERS OF GAS PLANT OF EVERY DESCRIPTION.

REGT TELEGRAPHIC ADDRESS: "GAS LEEDS"

R. DEMPSTER & SONS, Ltd.,

ESTABLISHED 1855.

ROSE MOUNT GAS ENGINEERING WORKS,

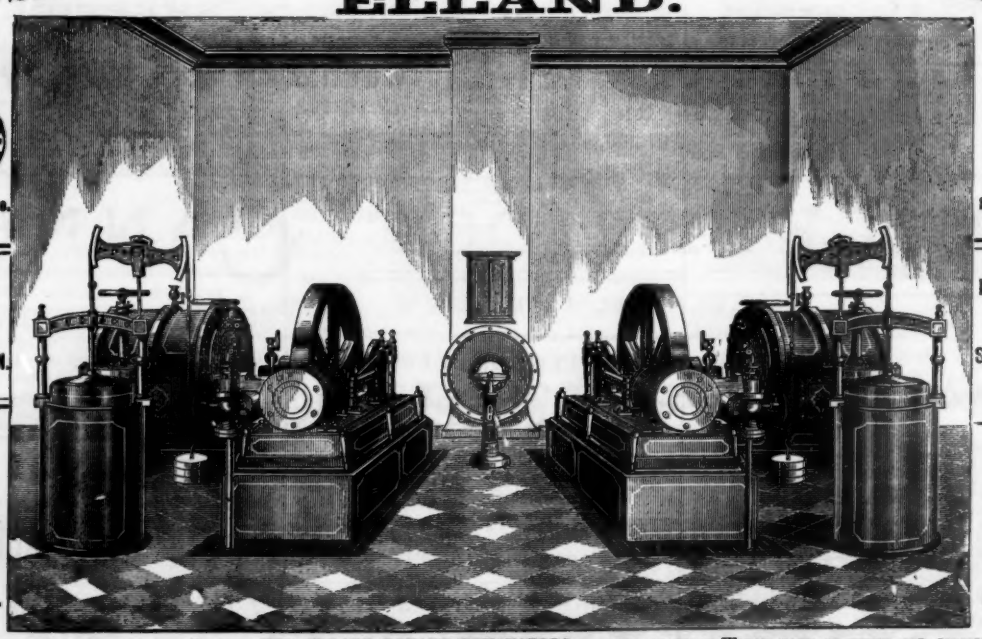
ELLAND.

No. 1. Flange Valve.

NO SLIP.

NO OSCILLATION.

No. 3. Screw Valve.



No. 5. Screw Valve.

NO HIGH SPEED.

STEADY GAUGE.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 60,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

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WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

J. & W. HORTON

ETNA WORKS,
SMETHWICK,
NEAR BIRMINGHAM
(Established 50 Years),

PATENTEES
AND
MANUFACTURERS
OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

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Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

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ESTABLISHED 100 YEARS.
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SULPHATE PLANT MANUFACTURERS
IN THE TRADE.

The present Low Prices render it absolutely necessary for Gas Engineers to use the commonest Pyrites Acid, and obtain the whitest and best quality of Sulphate, so as to obtain a better price and more ready market.

For this purpose they strongly recommend the

NEW IMPROVEMENTS

Combined with their

PATENT SAFETY CLOSED SATURATORS

Improved Self-acting AND *Steam Liming Process*

Under pressure, effecting a considerable Saving in Time in Working off the Contents of each Still.

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IN OPERATION.

A number of Plants on the Open System recently remodelled with greatly improved results.

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Messrs. ABBOT & Co. (Works at Gateshead-on-Tyne) employ 2000 men, including several experienced Plumbers, to erect New and remodel Old Sulphate Plants.

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ATLAS STEEL AND IRON WORKS, SHEFFIELD,
ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

BRECKENRIDGE CANNEL,
OF KENTUCKY, U.S.A.

The undersigned, SOLE AGENTS for this celebrated Gas Cannel, now offer it for delivery at any port in

GREAT BRITAIN,
ON THE CONTINENT,
OR SOUTH AMERICA.

This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing

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CAST-IRON PIPES, ETC.

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[ESTABLISHED OVER 50 YEARS.]

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A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

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THE WIGAN COAL & IRON CO., LIMTD.,

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Engineers, Ironfounders, and Contractors,

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MANUFACTURERS OF

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER 160 MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

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MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by Wire Rope, Steam, or Compressed Air.—The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of **CIRCULAR, OVAL, or Ω-shaped MOUTHPIECES**, with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

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